FORESTRY ABSTRACTS

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THE PRETREATMENT OF FOREST SEED TO HASTEN GERMINATION

Dormancy in seed has been defined as 'The condition of a seed . . . in which life functions are virtually at a standstill or, with more specificity, 'continued inactivity in the presence of conditions normally favouring germination'. All who have to raise crops by artificial sowing—farmer, forester, horticulturist, geneticist—are faced in some measure with the phenomenon and the problems it brings. The forester, at least in temperate regions, has more than his share of it. 'Refractory' or to use the older term 'rebellious' seeds are characteristic of many important conifers, notably the 5-leaved or White Pines, and of a variety of valuable broadleaved species, including certain species of *Acer*, *Tilia* and *Fraxinus*, the group of Red Oaks and a number of Leguminosae. Furthermore, the big rehabilitation and reforestation programmes of present-day forestry necessitate large-scale nursery work which taxes the silviculturist's resources in seed collection and bed space. Low and slow germination is wasteful of both seed and seedlings, increases weed growth and prevents an economical turnover of seedbeds. To cite a more direct issue, the demand for *Robinia pseudoacacia* in the U.S.A. for sowing up eroded ground has in recent years so embarrassed supplies as to make stimulation of its normally refractory seed a matter of urgency. U.S.D.A. Circular No. 453 quotes the average plant per cent. of this species as 8 for forty-two U.S. nurseries.

During the last century, and indeed well into this, the amount of research done on the forest side—whether fundamental or applied—was on a modest scale; and among the growing volume of subsequent work, comprehensive and detailed studies like Spaeth's [58], and Jacobs' [32], which test the effect of every sort of treatment on a refractory species, remain comparatively few. Different workers, moreover, have followed different standards in such vital matters as the selection of their seed material, the details of technique (e.g. washing after acid immersion, or the seed/solution ratio in soaking treatments) and the precise criteria adopted for evaluating results (the germination count). Any review of the subject tends in consequence to develop into a desultory catalogue of findings, lacking an assured basis of comparability. Nevertheless, so much solid work has been done and such positive results achieved with a variety of hastening treatments, that a fairly definite and useful picture can be presented for certain species and for certain types of stimulation.

Fundamental Considerations.

In a short review such as this, the findings of fundamental research on the causes of seed dormancy and the complex processes involved in removing them can only be briefly touched upon. For forest seed such studies are relatively few and the whole subject requires much further investigation.

Crocker, in a classic review [13], enunciated the subtleties of the dormant phase, and distinguished the main classes of dormancy recognized today: these are (*a*) an immature embryo, as occurs in *Ginkgo biloba*, where it may be rudimentary even when the seed is ripe, and in *Ilex opaca* and *Fraxinus excelsior*; (*b*) mature but cut off from water or gaseous exchange by an impermeable seed coat, as in the so-called 'hard' seeds of numerous Leguminosae; (*c*) mature but expansion prevented by the mechanical resistance of the coat structures; (*d*) a state of dormancy in the embryo itself or in some organ of it, so that, although morphologically mature, it cannot grow when naked and supplied with all ordinary, germinative conditions, but requires a period of "after-ripening', e.g. *Tilia*, *Juniperus*; (*e*) secondary dormancy, induced by certain adverse conditions, even in seed of species not showing primary dormancy, for example, in *Taxus*. Amongst subsequent workers with tree seed, Korstian [36], finding that pericarp removal in the Red Oak group did not break

their dormancy, and that the tannin content of the embryos differed little from that of the non-dormant White Oaks, pointed to the higher fat/carbohydrate ratio of the Red Oak embryos as a possible factor in dormancy. Much later Cox [12], working with hardwoods like *Quercus borealis*, *Fraxinus* spp., and *Acer saccharum*, localized the after-ripening process in the cotyledons and endosperm, and attributed embryo dormancy to structures limiting its oxygen supply or to enzyme inactivators in the endosperm. Other workers with Red and Black Ash (*F. pennsylvanica* and *nigra*) have shown that the excised embryos would grow in culture without after-ripening, and were not immature [11]. More recent work [62], elaborating on previous theories, attributes dormancy, particularly of the secondary type, to the accumulation of inhibitory intermediate products formed by 'partial anaerobic respiration', with hydrolysing processes in the embryo prevailing over an inhibited oxidation system; while the structure of the seed coat, as also external factors like temperature and moisture, condition the whole process. The temperature, and other conditions influencing the relative strengths of embryo and shell, and the enormous pressures exerted by developing embryos (28 atm. in *Juglans nigra*) have recently been demonstrated by a new technique [14] for certain nuts.

It is against this complicated background—of varied types of dormancy tackled by a variety of methods and combinations of methods—that the following account of treatment must be viewed.

Hastening Treatments.

It is a century or more since foresters on the Continent first experimented with acids and lyes to stimulate and improve the germination of tree seed; but it is only in the last few decades that treatments have been tried in great variety and on a wide and ever increasing range of species. Many of such treatments, from their elaboration or costliness, seem unlikely to leave the laboratory for the field, whatever their basic interest for science, and will therefore find only passing mention below. For one and all, it should be said that 'hastening' is a process carrying more than one implication. It may imply no advancement of the first date of germination but a quicker germination when once started; it can mean an earlier date without any acceleration of appearance (as compared with controls) thereafter; and it need not result in a higher ultimate germination per cent. In actual practice it frequently yields a combination of all three, bringing the ratio germinative energy/germinative capacity significantly nearer to unity for the species being treated; in short, seed is in general parlance effectively 'hastened' if it produces more healthy seedlings sooner.

Treatments may conveniently be discussed under the following heads:—

1. *Scarification.* This purely physical method, long used by farmers on dormant legumes like red clover and alfalfa, ranges from the nicking of individual testas with a knife or hand-file to mass abrasion in a power-driven drum, and for seeds with fleshy coats involves the question of depulping as well as decorticating. The method lends itself to large-scale, rapid processes [60] and mechanical sowing (which soaking treatments do not) but it reduces tolerance of storage and enhances the risk of fungi. It has been tried as a preliminary to other treatment, e.g. hot soaking, but this may be hazardous [cf. 8].

Chapman [10] produced 25 to 40 times the seedling count of controls, 5 weeks after sowing, from *Robinia pseudoacacia* seed treated in an Ames scarifier (1 bushel per 5 minutes). Peneff [47] had similar success, better than with H_2SO_4, using his own glass-splinter drum (50 r.p.m. for 15-30 minutes), results confirmed by Recke [51] and by Meginnis [41], who stressed the importance of regulating the severity of the treatment for individual batches of this highly variable seed.* Burton [8] had already demonstrated variability according to source for *Robinia* seed of Idaho and Austrian origin. Machine scarification is a recommended nursery practice in Holland [43]. Gindel [23], using a hand-file, achieved 75% germination in 16 days, acid and boiling water treatments proving inferior; he reported parallel success with *Gleditsia triacanthos* and *Ceratonia siliqua* but not with *Calycotome villosa*, *Melia azedarach* or *Pistacia atlantica*, where the other treatments were superior. With *C. siliqua*, deep unilateral filing gave the best results (79% in 20 days).

Barton, studying the permeation of leguminous seeds shaken (dry) for 20 minutes in a glass bottle, [7] found no hastening effect with Caesalpinioideae (e.g. *Gleditsia triacanthos*) but much with Papilionoideae (e.g. *R. pseudoacacia*). Similar treatment of *Prosopis juliflora* [42] and of *Albizzia acle* [16]

*Variability strikingly demonstrated by Nobbe, over 70 years ago [44].

has given good results, though Delizo noted much mortality from fungus with the latter species—apparently a common tendency with scarified seed. Eidmann [20], using a grindstone, reported marked hastening of *Acacia mollissima*. Akamine, working with *Santalum album* [3], found mechanical scarification ineffective or injurious, whereas removal of the testa by hand hastened germination. Spaeth reported that mechanical extraction of *Tilia americana* was difficult, owing to the combination of a tough pericarp and a brittle testa [58]; abrasion had a hastening effect but this was offset by mortality from fungus if the seed had not been sterilized by acid digestion of the pericarp.

As regards conifer seed, Pack [45] removed the testa of 4 American *Juniperus* species, without any hastening effect, although drum abrasion, using silicon carbide paper, has been recommended for this genus [37]. Jacobs [32] was equally unsuccessful with *Pinus lambertiana* and, like Delizo, recorded fungus attack. Larsen, however, found that mechanical abrasion not involving excessive pressure on the seed, was the optimum treatment for *P. monticola* [40]. The need for improved mechanical scarifiers and for better techniques in using them is stressed by several workers [e.g. 60]; as much germination may be lost by injury as is gained by the scarification, particularly with seed having great variability in the testa, like *Robinia pseudoacacia*.

Simple depulping. It seems the general experience [cf. 23, 53, 66] that germination is both hastened and increased by removing the pericarp before sowing. Puchner [50] demonstrated this for both *Fraxinus excelsior* and *Tilia europaea*, though germination remained slow, and Gindel found pulp retention particularly injurious to germination of *Melia azedarach* and *Gleditsia triacanthos* amongst others [23]. Depulping is recommended nursery practice in Holland [43] except for 'dry flesh' fruits like *Crataegus* and *Juniperus*, as also in India [30], though few positive results are available. Prasad, confirming earlier work by Laurie, got the best results from depulping *and* washing of *Azadirachta indica* [49]. Taylor considered the fermentation of pulp injurious only if continued until acetic acid was produced [61]; residual fermentation on depulped *Celtis occidentalis* was actually a stimulating factor. Spaeth found that if whole fruits of *Tilia americana* were stratified, any seeds rendered permeable were injured or destroyed [58].

2. *Water treatments.* Contact with water for varying periods and at varying temperatures was naturally one of the earliest 'hastening' methods to suggest itself; and as the large part played by chilling in the after-ripening process gained recognition, various methods of moist storage, generally at or near freezing temperatures, were elaborated under the loose term 'stratification' (Am. 'pregermination'). These must now be considered in turn.

2·1 *Soaking at Ordinary and Raised Temperatures.*

Soaking in ordinary water at room temperatures has not, as a rule, proved a potent hastener of refractory seed, save as an auxiliary to other treatments. Toumey and Durland in tests with 17 species, mostly American, but including Norway Spruce, Scots, Corsican and Austrian Pines, found 3-5 days' soaking generally stimulating and more than 10 days' the reverse, except for such hygrophilous species as *Taxodium distichum* [63]; as a rule, the later a species germinated naturally (e.g. *Pinus strobus* and *Abies balsamea*) the longer could its seed be soaked with benefit. Steven, in Britain, found 7 days best for Douglas Fir and Sitka Spruce and only one day for European Larch [59], while more than 7 days proved generally harmful. Jacobs [32] reported a 4-day soak the best of a wide variety of treatments for *Pinus lambertiana* (up to 80% germination in 20 days): two hours in hot water had a hastening effect but reduced the germination %. Wahlenberg found a 5-day cold soak just as effective for *Larix occidentalis* as fall sowing [67]. Holten [29] found 1 day the optimum for European Larch, Norway Spruce—a result confirmed by Johnson [33]—and Scots Pine, but soaking of Douglas Fir was ineffective. A 24-hour soak has been reported to hasten *Pinus longifolia* and *P. insignis* [31] and also *Prosopis juliflora* [25].

Among hardwoods, Taylor [61] reported marked stimulation from a 2 days' soak of *Ulmus americana* but none from soaking *U. pumila*. Gindel [23] found 21 days the best soak period for *Celtis australis* (93% in 40 days; control 0) and 12 days for *Melia azedarach* (better than scarification) while soaking was ineffectual with *Pistacia atlantica*. For *Robinia pseudoacacia* a 2-3 days' lukewarm soak is the recommended treatment in Holland [43] but higher temperatures are generally recommended for this much treated species. Chapman and others [10] found hot water moderately

effective, as did Burton [8] for seed of Austrian, but not Idaho, origin (22 hours' soak). Wilson [69] reported 1-2½ minutes' boiling to be far better—as also, strikingly, for *R. hispida* and *viscosa* [70]—results corroborated by Afanasiev [1] and recently also by Gindel (2-4 minutes). Akamine [3] found hot-water soaks ineffective or injurious for *Santalum album*. With *Acacia mollissima* Wimbush found boiling for 20 minutes less stimulating than putting the seed into water on the boil and leaving to cool and soak for 12 hours [71]. The latter seed also stored better (6 months versus one). Drees, working with 11 *Acacia* species, including *arabica* and *mollissima*, corroborated this but recommended up to 24 hours' soaking [17]. Similar treatment in India and Java hastened some species, including *A. decurrens* and *mollissima*, but not others [31, 20], e.g. *Prosopis juliflora* [25], while Harding [26] found up to 5 seconds' boiling the best stimulator for *A. pycnantha* and *A. acuminata*, the seed being storable after drying. Spaeth, however [58], reported hot-water treatment (above 80° C.) fatal for *Tilia americana* and colder water ineffective. With many species, boiling allows a very small margin for error, which may limit its practicability.

As regards the soaking of fleshy fruits, evidence is meagre. Paton [46] found this stimulated *Prunus serotina*, particularly if the pulp was rubbed off afterwards. In Madras a 48-hour soak of *Terminalia chebula* fruit, thereafter kept moist on straw in still air, hastened germination [31].

In general, the findings indicate that prolonged soaking is bad for most species, especially for conifers and in heated water, and that drying thereafter (for storage) should not be too rapid. Some workers stress the desirability of using minimum amounts of water, at any temperature, lest seed food-reserves get over-depleted by exosmosis, and in order to favour the maximum O_2 and CO_2 exchange that conditions the germinating phase. There are those who consider the effect of soaking to be partly bacterial. Thus Jacobs [32] could not repeat his stimulation of *P. lambertiana* seed with a soak of distilled water in sealed containers, even for 22 days, nor with chemical solutions that inhibited bacteria without acting on the testa.

2·2 *Stratification* (*Moist Storage*).

This term, as generally used, connotes the keeping of seed, layered or otherwise, in a variety of moist media (e.g. peat, sand, straw, soil) for varying periods and generally at a near-freezing temperature. At one extreme, however, may be included the various recognized methods for weathering the hard 'seed' of *Tectona grandis* in India, by sun-heating and watering in soil pits and/or in exposed layers—there are numerous variants [cf. 24]; at the other, the prolonged storage of numerous hardwoods and conifers under wintry conditions, natural or artificial, in order, chiefly, to promote the after-ripening of the embryo and surrounding tissues which constitutes a necessary prelude to germination in species inherently, i.e. embryonically, dormant. Such are found, for example, in *Tilia* and *Juniperus*. Both the cause of this dormancy and the biochemical changes involved in dispelling it are complex and still imperfectly understood. Flemion, for example, showed for *Sorbus aucuparia* that the seed coat played a rôle [21], the stratification period being reduced from 2-4 months to 6 weeks if the embryo was excised. Davis [15] associated low temperature with a change from oils to sugar, with a resulting acceleration of respiration when temperatures rose. There is usually a parallel change in the hypocotyl tissues, from alkaline to acid, the pH concentration and enzyme activity also increasing greatly [19].

Since the work of early experimenters like Pittauer [48] and Rose [55], both on *Pinus strobus*, a wide range of tree species has been successfully hastened by various methods of cold storage, even where their dormancy is not embryonic. Out of a mass of discrete data, only certain general trends and some salient departures from these can be noticed here. For both temperature and its duration the hastening optima are sometimes quite specific; but the most effective range is of a narrower order for temperature, viz. 35-45° F. or 2-8° C., than for time of application, viz. 1-4 months. Successful departures from these limits are few in terms of temperature and chiefly for not very refractory species [cf. 59 and 4], though Barton found 50° F. for 3 months the optimum for *Pinus lambertiana* [5, cf. 32]. Alternating temperatures proved ineffective with 5 species of Pines [5] and injurious for 4 species of Juniper [45] but were reported necessary for hastening *J. scopulorum* [1]. As regards duration, successful departures are fairly numerous, e.g. many Japanese conifers and hardwoods stratified in the open for 6 months or more [64], *Liriodendron tulipifera* for 4½–6 months [28, cf. 22], *Pinus cembra* from harvest (August) till spring [54], *Abies balsamifera* up to 8 months,

with the longer periods improving the onset but not the germination %, [52]; and at the other extreme, certain conifers and hardwoods for as little as 10–20 days [18], *Pinus monticola* for 3 weeks [40], certain of the Red Oak group for 20–30 days [1], *Pinus torreyana* for 25 days [35] and *Ulmus americana* for 2–4 weeks [6]. Most of these, however, are species of milder dormancy, which can benefit from both shorter periods and a wider bracket of chilling temperatures, as demonstrated by Barton for 4 Southern Pines [4]. Indications of an after-ripening process have been reported for numerous Eastern tree species, particularly *Actinophora fragrans* in Java [20], but the matter has so far received little study.

While most stratification processes have been evolved indoors under strictly controlled conditions, a number of workers have developed outdoor techniques with equal success, notably Tozawa in Japan [64], and Shumilina in Russia [57], both using a large number of species, and the latter a special elaboration of trenches, 'summer', 'warm winter' and 'cold winter', to treat a variety of hardwoods. D'yachenko, who worked out stratification schedules for numerous conifers and hardwoods cellared in sandboxes, stressed the value of the earlier germination thus obtained for seedlings facing a South Russian summer drought, and reported a superior all-round development for stratified plants in their first year [18]. In some cases fall sowing has been noted to be nearly as effective, *pacè* rodent damage, as artificial stratification in the case of certain Western Pines, e.g. *lambertiana*, *monticola*, and was recommended by Heit, *inter alia*, for *Sorbus aucuparia* [27].

Certain experimenters have successfully supplemented stratification with other treatments—notably for species of two-fold or complex dormancy—or have modified the ordinary stratification conditions, e.g. Larsen's and Johnstone's pre-soak of *Pinus monticola* [40] and Western Pine species [35] respectively, Pittauer's after-soak of stratified *Pinus strobus* [48] and Afanasiev's after-soak of stratified *Cercis canadensis* with both H_2SO_4 and (less effective) hot or boiling water [2]; whereas Taylor's 15–40 minutes pre-soak of *Pinus ponderosa* with H_2SO_4 and pre-scarification of *Juniperus virginiana* reversed the stratification stimulus [61]. Chadwick [9] removed the waxy coat of *J. virginiana* by several hours' soaking in alcohol or by boiling, before stratifying the embryo [cf. 1, 45, 61]. A pre-soak of the depulped seed, first in soda lye and then water, has also proved successful [68, cf. 61]. Both Spaeth [58] and Johnson [34] elaborated multi-phase treatments for *Tilia americana*, the latter's consisting of 3 days' or more water soak, drying, concentrated H_2SO_4 soak, seed scarification, then some 4 months' stratification at 40° F. [cf. 56]. Umland [65] hastened both germination and seedling development of *Nyssa sylvatica* by freezing the seed for 60 days in an iceblock, followed by 40 days' moist, cool storage. Lakon and Grisch [39], continuing preliminary research by the former [38], secured full germination of *Pinus strobus* by storing for 30 days at 8–12° C., then 14 days at 22–27° C. [cf. 48 and 55].

(*To be concluded.*)

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ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in other languages.

The term "billion" used in papers originating in North America means a thousand million.

0. GENERAL FORESTRY

02. TEXTBOOKS. LISTS OF VERNACULAR NAMES

See also *For. Abstr.* 10 (No. 877).

[850]. 02.1 (44). GUINIER, P., OUDIN, A., and SCHAEFFER, L. Technique forestière. **[Forestry technique.]** Librairie Agricole, Horticole, Forestière et Ménagère, 26 rue Jacob, Paris. 1947. pp. 376. [F.] Price 390 fr. (15*s.* 6*d.*)

03. OTHER SELF-CONTAINED GENERAL WORKS

[851]. 03 : 12.25. WATSON, H. **The Scots Pine: an introduction to forestry.** Oliver and Boyd, Edinburgh. 1947. pp. 82. Price 5*s.*

An illustrated life history of a tree, written and illustrated by a forester for the purpose of interesting young people in the planting of forest trees and making them understand the work of a forester.

05. PERIODICALS

05.3. *Annual Reports*

[852]. 05.3 (91). Dienst van het Boswezen in Indonesië: verslag over de periode 1940 t/m 1946. **[Forest Service of Indonesia: report for the period 1940–6.]** Archipel Drukkerij, Buitenzorg. 1948. pp. 159. [Du.]

[853]. 05.3 (911). SARAWAK. **Annual report of the Forest Department for the year 1946.** Forest Department, Kuching. 1947. pp. 18.

The first annual report to be issued since that for 1940.

06. CONFERENCES. PROPAGANDA

See also *For. Abstr.* 10 (No. 1511).

[854]. 06.2 (54) : 2. **Proceedings of the sixth Silvicultural Conference, Dehra Dun, April 2nd to 4th, 1945.** Forest Research Institute, Dehra Dun. 1947. pp. 226.

07. EDUCATION AND RESEARCH

See also *For. Abstr.* 10 (No. 1069).

[855]. 07.1 (481) : 82. WALLNER, O. Statlig yrkesskola för skogsarbetare i Norge. **[A state training school for forest workers in Norway.]** *Skogen* 35 (10), 1948 (119–21). [Sw.]

A brief account of the school at Sönsterud, established in 1946.

[856]. 07.1 (481) : 82. ABELL, J. En Skovarbejderskole. **[A training school for forest workers.]** *Dansk Skovforen. Tidsskr.* 33 (2), 1948 (48–60). [Dan.]

Describes, in general terms, the training school at Sönsterud in Norway. [Cf. preceding title.]

[857]. 07.2 (498) : 23.3. COMES, T. Experimentiile forestiere de la Sabed. **[Forestry research at Sabed.]** *Rev. Pădurilor* 63 (2), 1948 (43–5). [Rum.f.]

A brief account of the forest experiment station of Sabed, founded more than 50 years ago by the Hungarian Forest Service for the purpose of studying species, methods etc., for afforesting arid, S.-aspect areas in the plain of Transylvania. The station is now being administered by the Rumanian Forest Research Institute and the author indicates the present state and future programme of research.

[858]. 07.2 (97). **Recommendations for the organization of colonial research in agriculture, animal health and forestry: a report by the Committee for Colonial Agricultural, Animal Health and Forestry Research.** H.M. Stationery Office, London. 1948. pp. 16. *Colonial* No. 219.

[859]. 07.2. (97). **List of research workers in agriculture and forestry in the British Commonwealth.** Commonwealth Agricultural Bureaux Executive Council. 1947. pp. 333. Price 7*s.* 6*d.*

[860]. 07.6 (757) : 12.25 : 24 : 43.11. **The Southern Railway's demonstration forest.** *Sth. Lumberm.* 176 (2212), 1948 (46, 48).

The Southern Railway System's Lincoln Green Demonstration Forest near Dorchester, South Carolina, is designed to give object lessons to landowners in the management of Pine. The forest is composed mainly of *Pinus palustris*, with some *P. taeda* and about 600 acres of *P. caribaea*. A controlled-burning technique to reduce fire hazard has been developed and is carried out every 3–4 years during damp winter weather. Methods of thinning, selective cutting and replanting are also demonstrated. The forest is used as an outdoor laboratory by several forestry schools.

09.1. *Forest History*

See also *For. Abstr.* 10 (Nos. 864, 868, 879–80).

[861]. 09.1 (689) : 05.3. **Nyasaland Protectorate: Annual report of the Forestry Department for the year ended 31st December 1936.** Govt. Printer, Zomba [?1948] pp. 20.

Includes a brief account of the history and achievements of the department since 1891.

09.4. *Forest Statistics*

[862]. 09.4 (489) : 66. LØVENGREEN, J. A. Hugst og Hugstmulighed i danske Skove og Plantager. **[Fellings and possible fellings in Danish forests and plantations.]** *Dansk Skovforen. Tidsskr.* 33 (6), 1948 (205–37). [Dan.]

Collates in tables and graphs the available data for fellings made from 1938–39 to 1946–47 and proposed fellings up to 1976–77. These figures apply to some 74% of Denmark's forest area; for the remainder a rough estimate is made and combined with the former in a summary table and graph for the whole country.

[863]. 09.4 (494). **[Swiss forest statistics for 1946.]** *Schweiz. Forststatist.* 12 (2), [1947?] pp. 40. [G.F.]

Also corresponding reports for each of the years 1940–5.

[864]. 09.4 (569) : 94.11 : 96.5. GOOR, A. Y. **Forest areas in Palestine.** *Forest, Jerusalem* No. 1, 1947 (5–6). [Heb.]

A general account of the forest estate under Government control, how it came into being and the policy and plans for its future. Of the 26 million dunam (1 dunam = 0·23 acres) comprising Western Palestine, nearly 12 million are natural desert or rocky, 9 million agricultural, 4½ million pastoral, and about 850,000, i.e. 5·6% of all land not classed as desert, are under the Forest Department. Under the Forest Act of 1926 all land not definitely in private ownership could be proclaimed a Government Reserve and protected accordingly. Demarcation, gazetting and mapping, which were not put on a proper footing until 1928, covered 725,000 dunam by 1946, with another 119,000 in hand. No particular attention was paid to reserving land suitable for trees or to afforestation needs, and no survey of private forests was attempted.

In 1947 the Department was ordered (1) to reafforest the hill and other uncultivable areas, particularly for soil and water conservation and shelterbelts; (2) to fix and afforest the coastal dunes. To implement this programme it is trying to obtain large compact areas with not too poor a soil. While timber, fuel and charcoal production on a sustained basis is aimed at, a large proportion of these forests will also be used for pasture. Experts consider that 15% of Palestine (excluding desert) or 2¼ million dunam, should be forest, a target, however, which land pressure renders remote. With some 25% of the present Reserves probably unafforestable, future acquisitions cannot raise the total effective area to more than 750,000 dunam, with possibly another 100,000 dunam under private or institutional ownership. Any greater total can only come from creating windbreaks, avenues and more private groves. Altogether 900,000 dunam will need planting and the Department aims at supplying most of the stock. In the current year it is producing 4½ million seedlings, of which ⅔ will be distributed outside the Department. Supplemented by direct sowing, which has passed the experimental stage, a formation programme of 40–50,000 dunam yearly is aimed at within the next 5 years.

[865]. 09.4 (663). BELLOUARD, M. Accroissement de la production forestière au

Sénégal. **[Increase of forest production in Senegal.]** *Rev. int. Prod. colon.* 23 (225/226), 1948 (126–8, 133). [F.]

09.7. *Monographs of Individual Forest Regions*

See also *For. Abstr.* 10 (No. 1068).

[866]. 09.7 (471). ANDERSON, M. L. **Scandinavian forestry. III. Impressions of forestry in Finland.** *Emp. For. Rev.* 27 (1), 1948 (31–44 + 8 photos).

Following a brief visit to south-west Finland in the late summer of 1947, observations are made on a number of matters of forestry interest, especially to foresters in the British Isles. A brief survey is given of topography, geology and soil, followed by notes on the various forest stands and types and on general silvicultural practice and experimental work connected therewith. Some points of interest in management and utilization are reported. The Finnish organizations for forestry education and for furthering private forestry are described in some detail and certain effects of the last war and the peace treaty are alluded to. *Author's summary.*

[867]. 09.7 (489). CHAMPION, H. G. **Scandinavian forestry. IV. Denmark.** *Emp. For. Rev.* 27 (1), 1948 (44–7 + 4 photos).

Denmark has nearly 1,000,000 acres of forest or 10% of the land area. The climate is maritime, the annual rainfall being 17 to 34 in. with maximum in August. Strong winds and frost are important factors. The soils are almost all of glacial origin. The original vegetation was hardwood forest, mainly Oak and Beech, but in the west most has been denuded and replaced by heathland, whilst Beech predominates in the east. Modern forestry began with Von Langen in 1760, some of his plantings of conifers still surviving. Dune and heathland afforestation has been mainly done with *Pinus montana*; the older plantations are being converted to the more exacting conifers and hardwoods, whilst coniferous mixtures are being tried in more recent heathland planting. The Beech forests have deteriorated under past treatment and a larger part have been converted to Spruce, mainly on economic grounds, Spruce now being the country's most important species. National policy is now to preserve the remaining hardwood area and regeneration work is in progress, mainly sowing and planting under a shelterwood. Oak is usually raised with Birch or Alder nurses and is being thinned earlier and more heavily than elsewhere. Management is based on periodic enumerations giving data for growing stock, increment and age-class distribution, but the local officers have much latitude. Considerable attention is being given to genetic problems. *Author's summary.*

[868]. 09.7 (494). KREBS, E. Die Waldungen der Albis- und Zimmerbergkette. **[The forests of the Albis and Zimmerberg range.]** Kommissionsverlag der Genossenschafts-Buchhandlung Winterthur. [*n.d.*] pp. 329 + 2 maps. 276 [+ 136] refs. [G.]

A monographic study, with chapters on ecological factors, ownership conditions, previous utilization and management, history of changes in forest area and composition, present condition and treatment, future policy and problems needing investigation.

[869]. 09.7 (576) : 2 : 31.27 : 96. MEGAVORYAN, L. O. Lesnaya problema Uzbekistana. **[The forestry problem in Uzbekistan.]** *Lesnaya Prom.* 1948 (2), (5–9). [Russ.]

Uzbekistan has a long history of continued deforestation, and only 6% of the country is still wooded. Of the natural forests, the mountain forests contain 89·5% of the remaining growing stock. They lie chiefly in remote tracts where logging is difficult, and their main function is soil and water conservation. Fellings are restricted to tending operations and the annual yield is not more than 50,000 cu.m. The chief species is 'Archa' (a tree Juniper). The riverside forests in valleys of the Syr Darya, Amu Darya, Zeravshan and other rivers, consist mainly of Poplars (*Populus* Sec. *Turanga*), Willows and *Elaeagnus*, with poor stem form, yielding mainly firewood and only an estimated 700–750 cu.m. of timber annually. A 10-m. strip along the river banks is protected as a safeguard against bank erosion. The desert steppe formations, consisting of shrubby species such as *Haloxylon ammodendron* and *Tamarix* spp., are useful in sand fixation and should continue to be protected. Tending operations yield up to 20,000 cu.m. annually of Tamarisk firewood, which is taken by camel to settlements, usually not more than 12 km. distant.

Plantations have been raised by the Ministry of Water Management along canals, on waste land, and in the form of shelterbelts. Those along the larger canals furnish building timber, firewood and faggots from thinnings. The yield for 1938–41 was 123,000 cu.m. and the growing stock in 1941 was estimated at almost 1 million cu.m. Plantations by smaller canals in the Tashkent region were estimated in 1942 to have a total growing stock of 413,500 cu.m. (including Mulberry and other fruit trees), of which about 69,000 cu.m. is exploitable timber. Irrigated plantations also exist on patches of waste land unfit for agriculture. Species grown include 'Black Pyramidal' and 'Turkestan' Poplars, *Robinia pseudoacacia*, *Ailanthus* and *Gleditsia*. Growth rates are 3–4 times as rapid as those in the mountain forests. Poplars in irrigated plantations reach 10–20 cm. d.b.h. at 8–12 years, and it is estimated that 1 ha. of Poplar would yield 1,000–2,500 cu.m. in 10–20 years.

Tables are included of specific gravity and strength properties of wood of some species grown in both mountain forest and canal-side or irrigated plantations. The strength of *Robinia pseudoacacia* was much higher than that reported from other sources: *Ailanthus* differed little in strength from imported Oak; and wood of 'Turkestan Poplar' could replace imported Pine. There was no evidence that wood from mountain forest was markedly superior to that of canal-side trees. Air seasoning under a roof in the open proved quite satisfactory.

There is plenty of scope for *Robinia* and *Ailanthus* in the plantations, and both will yield useful timber at 15–25 years of age. *Ailanthus* is not exacting as to soil, regenerates naturally by seed or vegetatively and suffers little from insect pests or cattle. In closed stands it forms a straight bole with the live crown starting at a height of 6–12 m. The timber is eminently suitable for furniture.

Mention is made of extensive stands of *Pistacia vera* in the mountains. The wood of this species is similar in properties to that of *Parrotia persica*, its leaves can be used as tan-stuff, a resin obtained by tapping is suitable for use in high-voltage cables etc., and the fruit is edible.

Afforestation in the mountains will be limited to what is needed for establishing protection forests. In the valley forests and along canals etc., extensive plantations should be made and more valuable species introduced, while in the desert-steppe woody growth should be conserved and extended, primarily for sand fixation and shelter for crops, and secondarily to help meet the firewood shortage.

[870]. 09.7 (591). ATKINSON, D. J. **Forests and forestry in Burma.** *J.R. Soc. Arts* 96 (4772), 1948 (478–91). D.S.I.R.

[871]. 09.7 (661 : 671 : 672). AUBRÉVILLE, A. Richesses et misères des forêts de l'Afrique noire française. Mission forestière: A.E.F.—Cameroun—A.O.F. 1945–6. **[Riches and poverty of the forests of French tropical Africa. The forest mission, 1945–6, to French Equatorial, Cameroon, and French West Africa.]** Paris. 1948. pp. 250. [F.]

Includes the following sections:—(1) Northern French Equatorial Africa (Forest ecology and phytogeography); (2) the Okoumé (*Aucoumea klaineana*) forest of Gabon [cf. *For. Abstr.* 10 (No. 191)]; (3) the long-dry-season regions of Cameroon and Oubanga-Chari [cf. *For. Abstr.* 9 (No. 46)]; erosion and 'bovalization' in tropical Africa [cf. *For. Abstr.* 9 (No. 1441)]; the forest resources of the Ivory Coast and Cameroon [cf. *For. Abstr.* 9 (No. 2161)]; general ecological observations [cf. *For. Abstr.* 9 (No. 2652)]; the copal- and resin-producing trees of French Equatorial Africa [cf. *For. Abstr.* 10 (No. 622)]; Casamance [cf. *For. Abstr.* 10 (No. 94)].

[872]. 09.7 (72) : 31.0. **Agricultural, pastoral and forest industries in Mexico.** United States Tariff Commission, Washington, D.C. 1948. pp. 84. 12 tbls.

[873]. 09.7 (728.6) : 11.62 : 91. VOGT, W. La población de Costa Rica y sus recursos naturales. **[The population of Costa Rica and its natural resources.]** *Rev. Agric., Costa Rica* 19 (10–12), 1947 (439–43, 445–51, 453; 491–95, 497–9, 501–3, 506–7; 535, 537–43, 545–7, 549–51). [Span.] A.C.P.

A general study of the natural resources of Costa Rica, which, although adequate for the present population, are declining, while the population is increasing. Causes of the exhaustion of the soil and the effects of over-exploitation of the forests on soil erosion and the water regime are discussed. The forests do not constitute a great source of wealth, since many areas are inaccessible, and, in the

tropical regions, many species are without economic importance. Much of the forest grows on land unsuitable for cultivation, but of paramount importance for soil conservation, e.g. steep gradients, or soils with a very shallow A horizon. It is, however, not managed or protected in any way but over-exploited, particularly by charcoal burners, whose primitive kilns cause many forest fires. The author strongly recommends the immediate formulation of a conservation programme, which would include, among other things, an inventory of resources, a study of suitable species for reforestation and of the country's particular soil-erosion problems, the control of fellings and the creation of forest reserves.

[874]. 09.7 (758 : 759 : 76). ELDREDGE, I. F. **The four forests and the future of the South.** Charles Lathrop Pack Forestry Foundation, Washington, D.C. 1947. pp. 65. Price $1.00.

A general account, in popular terms, of the forest regions of the deep South.

[875]. 09.7 (81) : 12.25 : 21 : 12.19 : 3 : 12.26–8 : 22.89 : 57 : 64. AUBRÉVILLE, A. Quelques problèmes forestiers du Brésil. La forêt de pin de Parana. Les plantations d'*Eucalyptus*. **[Some Brazilian forestry problems. The Parana Pine forest. The Eucalypt plantations.]** *Bois For. Trop.* No. 6, 1948 (102–17). [F.]

Includes:—(1) a short account of the forests of Brazil; (2) a fairly full account of the biology, ecology, silvicultural characters and exploitation of *Araucaria angustifolia* [cf. *For. Abstr.* 10 (No. 976)]; (3) an account of the Eucalypt plantations in the State of São Paulo, with particular reference to variations in yield according to site quality (e.g. from 300 to 1,100 cu.m. of firewood per alqueire [2·42 ha.] in 7- to 10-year-old plantations spaced 2 × 2 m.), and some ecological notes on the Eucalypts at the research station of Rio Claro.

[876]. 09.7 (82). PERRET, G. La sylviculture en république argentine: régions boisées, peuplement, exploitation, transport, débouchés. **[Forestry in Argentina: forest regions, stocking, exploitation, transport, markets.]** *Rev. int. Bois* 15 (132/133), 1948 (130–4). [F.]

[877]. 09.7 (935) : 31.0 : 34. WALKER, F. S. **The forests of the Solomon Islands Protectorate.** The Government of the British Solomon Islands Protectorate. 1948. pp. 106 + 15 maps. Price 30*s*. P.R.

This, the first published report on the whole territory, comprises: a general description of the country and its forest types; a detailed description of present conditions including area of forests, the most important forest products, the ownership of land and forest produce, the present position of forestry, and detailed description of the islands; a section on future forest policy (wherein the need of a forest department is stressed); an index of vernacular names; description of different species, timbers and their uses; and an index of botanical names.

[878]. 09.7 (941) : 31.0. STOATE, T. N. **Forestry in Western Australia with notes on the principal timbers.** *Bull. For. Dep. W. Aust.* 1946. pp. 28.

General notes on Australian forestry, on plantations of Pine (*P. radiata, P. pinaster*) and Mallet (*Eucalyptus astringens*) in W. Australia and on silvicultural research, with a list and description of properties of the principal W. Australian timbers, comprising *Eucalyptus* spp. *Acacia* spp., *Casuarina fraseriana, Santalum spicatum, Banksia verticillata* and *Xylomelum occidentale*.

[879]. 09.7 (961). SETTEN, G. G. K. **An outline of the progress of forestry in Fiji.** *Malay. Forester* 11 (3), 1948 (99–114). 9 refs.

Contains (1) a general description of the territory; (2) a short account of its forest history up to 1938 when a Forest Department was established, (3) an account of forest conditions in 1938 and a résumé of the Department's work up to 1947.

[880]. 09.7 (969) : 09.1 : 21 : 07.5. BRYAN, L. W. **Twenty-five years of forestry work on the Island of Hawaii.** *Hawaiian Planters' Record* 51 (1), 1947. pp. 81 + map. L.S.

A summary of the work of the Division of Forestry and private owners in the creation of forest reserves and tree planting in Hawaii. In 25 years over 9 million trees have been planted on the island. Extensive experiments in raising native and exotic species have been carried out in the island's arboreta, and the report includes tabulated results of a survey of the arboreta, in which each species was classified according to vigour, appearance, reproductive ability and freedom from disease.

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.2. *Climate and Microclimate*

See also *For. Abstr.* 10 (No. 1480).

[881]. 11.22 : 91.3. HURSH, C. R. **Local climate in the Copper Basin of Tennessee as modified by the removal of vegetation.** *Circ. U.S. Dep. Agric.* No. 774, 1948. pp. 38. 27 refs.

Meteorological records were collected for 3 contiguous areas which once supported a uniform hardwood forest, but are now characterized by forest, grass, and bare soil respectively. From June to October inclusive, when vegetation is in full foliage, the mean monthly maximum air temperature was found to be 2·1°–3·5° F. higher in the bare zone than in the forest, and during the winter months 0·6°–2·0° lower. The difference in soil temperature was still greater: during the months of full foliage, the mean daily range of soil temperature at a depth of 1·2 in. was 33·5° F. in the bare area and 10·9° F. in the forest [cf. *For. Abstr.* 10 (No. 883)]. Wind movement at a height of 2 ft. had increased 5–15 times in the open as compared with the forest. Total annual evaporation for the 3 zones was: bare 56·95, grass 46·19, forest 17·76 in.

11.4. *Soil*

See also *For. Abstr.* 10 (Nos. 936, 941–2, 1049).

[882]. 11.4 (795 : 797). TARRANT, R. F. **A guide for forest soil examination in the Douglas Fir region.** Pacif. Nthwest. For. Range Exp. Sta. 1947. pp. 27 + 3 tbls. 13 refs.

Some of the rudiments of forest soil science with particular reference to the Douglas Fir region of the United States.

11.41. Soil Physics

See also *For. Abstr.* 10 (Nos. 1064, 1499).

[883]. 11.41.1 : 12.19.2–3 : 91.3. SAKHAROV, M. I. Zavisimost' temperaturnogo rezhima pochvy ot kharaktera lesnogo pokrova. [**Dependence of the temperature régime of the soil on the character of the forest cover.**] *Pedology* 1948 (3), (157–66). 14 refs. [Russ.] [Belorusski Lesotekhnicheski Institut.] A.P.B.

Deals with hitherto unpublished observations made in 1911–13 on medium-podzolized sandy soil, with no iron-pan, in 3 types of vegetation in the Bryansk experimental forest, viz. (1) stands of reed grass (*Calamagrostis epigeios*) on a cleared area, (2) a 90-year-old single-storeyed Scots Pine forest (*Vaccinium vitis-idaea* type), and (3) a Pine forest of the same type and age but with a second storey of Norway Spruce. Results were as follows:—(*a*) The mean annual temperature and the mean annual maxima at the soil surface were respectively 2·3 and 6·0° C. higher in (1), and 0·8 and 2·1° higher in (2), than in (3). The absolute maxima were 52·3° for (1), 41·3° for (2) and 31·5° for (3). (*b*) The mean annual minima in (1) and (2) were respectively 3·1 and 0·8° lower than in (3). The absolute minima were –38·3°, –28·5° and –26·5°, and the number of days with temperatures below 0° were 193, 167 and 155, respectively. (*c*) The mean annual soil temperatures at depths down to 2·0 m. were 1·7–2·4° higher in (1), and 0·6–1·2° higher in (2), than in (3). Results are shown in tables. [Cf. *For. Abstr.* 10 (No. 881).]

11.43. Biology of Soil, including Mycorrhiza

See also *For. Abstr.* 10 (Nos. 901, 1464).

[884]. 11.43.1 : 12.21. STÖCKLI, A. Über den Bakteriengehalt alpiner Böden. [**The bacteria content of Alpine soils.**] *Annu. agric. Suisse* 1948 (1), (1–19). 9 refs. [G.g.f.] E.M.B.

A study was made of the influence of the pH, quantity, and properties of the organic matter in the soil upon its content of aerobic and heterotrophic bacteria. It was demonstrated that the concentration of H ions has not the effect usually attributed to it, on heterotrophic soil bacteria. Very acid soils with pH values down to 3·2 may, in some circumstances, harbour considerable quantities of bacteria. The low bacteria content often observed in raw-humus soils and peat bogs of great acidity is to be attributed less to the concentration of H ions

than to the condition of their organic substances. It is also possible that, in acid coniferous-forest soils, fungal mycelia and mycorrhiza compete with bacteria in utilizing the decomposable substances or prevent their establishment by the secretion of antibiotic substances. The organic substance of soils rich in humus is, in general, poorer in bacteria than that of soils deficient in humus. The bacterial content of organic soil substances may be notably influenced by the application of organic manures. In the soils studied (coniferous forest, Pine forest, high peat bogs, pasture, arable, meadow, garden) the bacterial content increased in proportion to the annual accession of easily decomposable organic substances. The organic substance in the soil becomes richer in bacteria with increasing depth. For studies in the comparative bacteria content of different soils, figures based on a unit of weight should not be used; exact values can only be obtained from the number of bacteria per unit of volume. On the other hand, figures based on a unit of weight of organic substance give valuable results for the study of bacterial decomposition of organic substance. *From author's summary.*

[885]. 11.43.1 : 12.25 (689). **[Mycorrhiza on seedling Pines grown in uninoculated soil.]** *Rep. For. Dep. Nyasald. 1946*, [1948?] (7).

Seed of *Pinus taeda* and *P. caribaea* collected from 12-year-old trees at Zomba was sown in tins in ordinary garden soil which had not been inoculated with mycorrhiza-bearing soil from a Pine stand. Germination and growth were perfectly normal and the roots [at the time of writing] had fully developed mycorrhiza.

[886]. 11.43.2 : 12.19.2–3 (78). HOFF, C. C. **Soil and soil invertebrates of Aspen groves in the central Rocky Mountains.** *Abstr.* in *Bull. ecol. Soc. Amer.* 28 (4), 1947 (50). A.P.B.

A study was made comparing the climatic and edaphic conditions and the soil invertebrates of 15 Aspen groves and the bordering climax and sub-climax coniferous forests at elevations of 7,600 to 10,000 ft. in Colorado and Wyoming. In most areas soil invertebrates were much more numerous in the Aspen groves than in the coniferous forests. With one exception the soil from the Aspen groves was slightly more alkaline and had a higher water content than soil from the coniferous communities.

11.47. Maintenance of Favourable Soil Conditions

See also *For. Abstr.* 10 (Nos. 966, 1029, 1049, 1464, 1466).

[887]. 11.47 : 11.49.2. GREENE, H. **Using salty land.** *FAO agric. Stud.* No. 3, 1948. pp. 49. 39 refs.

A study of the reclamation of saline soils, which reviews reclamation so far carried out in the Sudan, China, California, Northern India, Russia, and Hungary.

[888]. 11.47.13 : 12.25 : 42.5. **Fertilizer experiments in Pine plantations.** *21st Rep. Coun. sci. industr. Res. Aust. 1946–7*, 1947 (18).

Fertilizer experiments in *Pinus taeda* plantations indicate that the treatments need renewal to maintain healthy growth. On plots treated with superphosphate in 1939 and 1941, 'needle fusion' symptoms are reappearing and extra growth is less marked, though these changes are less evident in plots treated with 3 cwt. per acre than in those where only $\frac{3}{4}$ or $1\frac{1}{2}$ cwt. per acre was used. The 3-cwt. treatment has already produced extra timber to show a profit on the cost of application, as have also treatments of $2\frac{1}{2}$ cwt. per acre of ground rock phosphate or 2 cwt. of superphosphate applied to adjacent plots of *P. caribaea* in 1939.

[889]. 11.47.21 (689) : 34.23 : 11.42.1. YOUNG, R. S., and GOLLEDGE, A. **Composition of woodland soils and wood ash in Northern Rhodesia.** *Emp. J. exp. Agric.* 16 (62), 1948 (76–8). 3 refs. O.R.E.

Analyses of Northern Rhodesian soil and of wood ash from local tree species show that the primitive method of agriculture ('chitemene'), whereby wood is burned on agricultural soil before crops are sown, makes available large quantities of readily available nutrients for plant growth, particularly Ca, P and K, in which the soils of this region are very deficient.

11.6. *Hydrographical Conditions. Water and Soil Conservation*

See also *For. Abstr.* 10 (Nos. 873, 1033, 1037–40, 1045, 1511, 1528).

[890]. 11.6 (545) : 23.3. GORRIE, R. M. **Soil and water conservation in the Punjab.** Govt. Press, Lahore. 1946. pp. viii + 290.

This manual attempts to lay down the details of practical field work in the various phases of afforestation of catchments, reclamation of torrent beds and waste land, and the control of run-off from cultivation. In order to show the relationship of erosion control with flood reduction, a detailed analysis has been made of erosional processes by water and wind as occurring in the Punjab, and the extent to which both are responsible for the destruction of cultivable land and for loss of fertility in land still under cultivation. The steps by which these processes of destruction and desiccation can be reversed are detailed, emphasizing water conservation as an essential step in the fuller use of land. *Author's summary.*

[891]. 11.6 : 07.7. COLMAN, E. A., and HAMILTON, E. L. **The San Dimas lysimeters: instruments for evaluating the water economy of chaparral vegetation.** *For. Res. Notes Calif. For. Range Exp. Sta.* No. 47, 1947. pp. 33. 10 refs.

Part I describes, with illustrations, the 5 types of lysimeter used in the San Dimas Experimental Forest (San Gabriel Mountains), their respective functions and their treatment in the preliminary phases of the experiment, i.e. from 1937 to 1946. All are of the filled type, with homogenized soil. Part II analyses the relative performance of 4 of the lysimeter types, with special reference to water content, under the preliminary treatments; improvements in the design of 'confined' lysimeters are specified, in order to minimize certain inconsistencies discovered.

[892]. 11.62 (931). CUMBERLAND, K. B. **Soil erosion in New Zealand.** Whitcombe & Tombs Ltd., Auckland, N.Z. 2nd ed. (rev.), 1947. pp. 228 — 60 photos, 2 maps. 348 refs.

[893]. 11.62.1 : 91.3 : 32. LIEBERMAN, J. A., and HOOVER, M. D. **Uncontrolled logging damages water quality.** *Res. News Stheast. For. Exp. Sta.* No. 1, 1948 ([1]–[2]).

Measurements have been made on the Coweeta Experimental Forest of changes in water quality brought about by a typical southern Appalachian logging operation. During a 3-month period in the summer of 1942, 250 cu. ft. of eroded material were collected from a portion of skid road 450 ft. long and 5 ft. wide on a 30% gradient. Water samples collected daily from the logged area were compared with those collected from an adjacent undisturbed catchment area. Analysis of the turbidity determinations for the period June 10–September 21, 1946, gave the following results: logged area, average turbidity 93·7 p.p.m., maximum turbidity 3,500 p.p.m., and modal value of turbidity 36 p.p.m.; the corresponding values for the undisturbed area were 4·3, 80, and 2·0.

[894]. 11.62.1 : 11.44. **[Effect on run-off and erosion of removing forest litter.]** *Rep. Rocky Mt. For. Range Exp. Sta. 1947*, 1948 (26–7).

Six $\frac{1}{100}$-acre plots were laid out in a dense stand of second-growth Ponderosa Pine with a slight mixture of Aspen. All litter and duff was removed from the surface of 3 of these plots in June, 1941, care being taken not to disturb the humus layer or any living plants, as the effect of the undecomposed material alone was to be evaluated. The equivalent of 20 tons of organic material per acre was removed. The other 3 plots were left undisturbed. During the 7 years following this treatment, litter was allowed to accumulate, with a consequent gradual reduction in the effects of removal. During the first 15 months surface run-off was more than doubled, and erosion was increased about 72 times. Thereafter both run-off and erosion decreased because of re-accumulation of litter.

[895]. 11.62.11 (548). DAVIS, P. W. **Contour bunding and trenching as counter erosion measures on the Nilgiris.** *Indian For.* 73 (12), 1947 (537–8). (7th All India Silvicultural Conference, Dehra Dun (1946).)

The inadequacy of experimental contour drains, laid out in 1941 by the Soil Erosion subcommittee of the Nilgiris District Periodical Council, was due to:—(1) the fact that strict contour levelling of the drains was not possible in the first place, and (2) neglect of subsequent maintenance, whereby deposited silt was allowed to accumulate in the drains.

[896]. 11.62.3 (68) : 43.11. RYCROFT, H. B. **A note on the immediate effects of veld burning on stormflow in a Jonkershoek stream catchment.** *J. S. Afr. For. Ass.* No. 15, 1947 (80–8). 13 refs.

An investigation into the effect of autumnal veld burning on stream behaviour in a Jonkershoek stream catchment showed that during

the winter following the fire there was a highly significant increase in the rate of stormflow, a rise in flood heights, an increase in the volume of stormflow, and an increase in stream discharge. These conclusions indicate that there is a serious danger of flooding and erosion if the protective vegetation is removed by late autumn burning. *Author's summary.*

12. FOREST BOTANY. TREE SPECIES

12.1. *General Botany*

12.11. Physiology. Reproduction. Growth

See also *For. Abstr.* 10 (No. 1479).

12.11.1. *Metabolism. Plant Constituents. Translocation. Sap Flow, etc.*

See also *For. Abstr.* 10 (Nos. 923–4, 1059, 1113, 1128–30, 1338, 1342–4, 1354, 1358–62, 1366).

[897]. 12.11.1 : 12.14.5 : 12.25–8. BURSTRÖM, H. **The rate of the nutrient transport to swelling buds of trees.** *Physiol. Plant.* 1 (2), 1948 (124–35). 3 refs. [E.e.]

Cf. *For. Abstr.* 10 (No. 63).

Computations have been made on the rates of water and phosphorus transport to the swelling buds of *Carpinus* and *Fagus* before the leaf development in the spring.

Carpinus bleeds copiously if wounded during the swelling period, *Fagus* does not, but with respect to the normal nutrient transport there is little difference between the two species.

In both trees the buds absorb phosphorus to a greater extent than water if the xylem sap is considered as their source of nutrients. The buds take their water during the swelling period from distances in the branch system of at least 1·5 and 2·5 m. respectively in *Carpinus* and *Fagus*. Phosphorus is utilized from distances between 0·15 and 1·1 m. in *Carpinus*, and between 0·3 and 1 m. in *Fagus*. It is possible that phosphorus is transported passively to the buds with the water, but such a mass flow cannot pass through the xylem, where the sap is too diluted.

If, on the other hand, the whole current of water passes through the phloem, the rate of the water flow amounts to about 5·7 and 10 mm. in one hour in *Carpinus* and *Fagus* respectively. These figures are much lower than values reported for phloem streams, so that the capacity of the phloem may be sufficient for such a transport. The composition of the phloem sap has not been determined.

The observations will be continued in '48. *Author's summary.*

[898]. 12.11.1 : 12.26–8 : 12.14.5. OLSEN, C. **Adsorptively bound potassium in Beech leaf cells.** *Physiol. Plant.* 1 (2), 1948 (136–41). 5 refs. [E.e.]

In Beech leaves that have been frozen and afterwards thawed out, one finds in the summer months about 30% of the total K content to be adsorptively bound. This percentage decreases from late in September, and shortly before defoliation all the K is present in dissolved state in the cell sap.

The adsorptively bound K in the Beech leaves can be completely displaced by addition of a 0·1 *N* $CaCl_2$ solution. An addition of KCl causes a further adsorption of K.

If increasing quantities of water are added to the Beech leaves, increasing amounts of the adsorbed K are dissolved, and all the K bound can be brought into solution by washing with water when a sufficiently large number of washings are carried out.

Part of the Ca and Mg in the Beech leaves is likewise adsorptively bound inasmuch as solutions containing other ions act more dissolvingly on the calcium and magnesium than does pure water. Here, however, increasing quantities of water do not have the effect of bringing more Ca and Mg into solution.

The adsorptively bound K is assumed to be bound to the proteins of the cells. *Author's summary.*

[899]. 12.11.11 : 12.26–8 : 33.36.3 : 31.8. CHENERY, E. M. **Further notes on aluminium in trees.** *Emp. For. Rev.* 27 (1), 1948 (129–30).

A list of aluminium-accumulating plants, supplementary to the author's earlier list [cf. *For. Abstr.* 8 (No. 2284)]. Families not previously recorded as aluminium accumulators are—Lauraceae, Violaceae, Polygalaceae, Cryptereoniaceae, Rhizophoraceae, Cunoniaceae, Escalloniaceae, Celastraceae, Icacinaceae, Octoknemataceae, Loganiaceae. These lists should interest wood technologists since the wood of

aluminium-accumulating species needs special care in seasoning, to prevent checking.

[900]. 12.11.11 : 12.26–8. COUCH, J. F. **The occurrence of rutin in a wild cherry, *Prunus melanocarpa* (A. Nels.) Rydb.** *J. Amer. chem. Soc.* 70 (1), 1948 (256–7). 5 refs. [Eastern Regional Research Laboratory, Philadelphia.] O.R.S.

[901]. 12.11.13 : 12.26–8 : 12.24 : 11.43.1. POEL, L. W. **Effects of aeration on bracken and heather grown in nutrient solution.** *Nature, Lond.* 162 (4107), 1948 (115–6). [Department of Botany, Agricultural College, Glasgow, C.2.]

Solitary bracken sporelings bearing a few small fronds and roots were placed in jars containing a variant of Knop's solution. One series of 8 jars was aerated continuously for 2 months; a second series was left unaerated, and nitrogen from a cylinder bubbled through a further 8 cultures. *Calluna* seedlings were grown under substantially similar conditions. The mean lengths of roots (cm.) of bracken under the 3 treatments were respectively 22·6, 6·7, 6·2; those of *Calluna* 8·1, 15·3, 8·2. The roots of aerated bracken plants were much branched with swollen tips, those of unaerated plants had no lateral branching and no swollen root tips. The aerated heather plants, while apparently healthy, were of smaller stature than the unaerated and the mycorrhizal fungus had few external hyphae. In unaerated plants, both root and shoot growths were luxuriant. Mycorrhizal development was little different from that in aerated plants. Under the nitrogen treatment, external hyphae were more frequent and the mycelium in the root cells was often in an advanced stage of digestion.

Work on the respiration rates of the roots in relation to oxygen supply, and on the precise oxygen concentrations in various bracken and heather soils is being carried out.

12.11.2. *Reproduction. Propagation. Growth. Development*

See also *For. Abstr.* 10 (Nos. 915, 922, 1029, 1039).

[902]. 12.11.2 : 12.11.15 : 12.21. BOSE, S. R., BOSE, A. B., and DEY, K. L. **Effect of crude polyporin on seed germination and root growth: a preliminary study.** *Science* 107 (2768), 1948 (63). 5 refs. O.R.S.

Root development was obtained on exposed surfaces of branches of *Psidium guajava* and *Eugenia jambos* treated with crude polyporin. Partial inhibition of germination was noted in seeds of *Cicer arietinum* soaked for 24 hours in water containing polyporin.

[903]. 12.11.21 : 12.25 : 23.13. STEFANSSON, E. Strangulering av fröträdsställningar. **[Strangulation of trees in open stands of seedbearers.]** *Skogen* 35 (8), 1948 (96). [Sw.]

In the author's experience, strangulation of young Scots Pine or Norway Spruce markedly stimulates flowering as early as 2–3 years after the operation. Production of male flowers is especially stimulated [cf. *For. Abstr.* 9 (No. 1455)], but the number of female flowers may also be increased. Pine cones from treated trees have in most cases been normally developed and have yielded seed of good viability. In experiments with Spruce, made at higher altitudes, where the cone moth [*Laspeyresia strobilella*] destroyed almost all the seed, cone development was poor throughout, owing to the unfavourable climate, and no difference in cone size was observed between treated and untreated trees.

Strangulation of older (40- to 70-year-old) trees takes longer (at least 4 years) to give the desired effect, and so far only weak stimulation of flowering has been observed. On the other hand, the effects of ringbarking (leaving at least 2 in. of bark intact) and often also root pruning (at least 1 m. from the butt of the tree, leaving some strong roots intact), are clearly detectable after 3 years.

The author does not believe that significant increase in the seed production of older conifers could be achieved by strangulation. Root pruning would be unsuitable for open stands of seedbearers owing to the risk of windthrow. For such stands the most promising method of inducing seed production might be a combination of ringing and phosphate fertilizing.

[904]. 12.11.21 : 12.25. ROE, E. I. **Early seed production by Balsam Fir and White Spruce.** *J. For.* 46 (7), 1948 (529).

Seed-bearing cones were found on a 15-year-old Balsam Fir and three 16-year-old White Spruces. A cutting test showed that the seed from the former were 50% filled, and germination tests on the latter gave an average of at least 5 germinable seeds per cone.

[905]. 12.11.22 : 12.11.3. PAULEY, S. S. **Budding as a silvicultural technique.** *J. For.* 46 (7), 1948 (524–5). 9 refs.

Results of several budding tests at the Arnold Arboretum and Harvard Forest are briefly described and their significance to forestry discussed. The following are reported as promising combinations: Sugar Maple on Red Maple; diploid, tetraploid, and hexaploid White Ash on diploid White Ash; Green Ash and Red Ash on White Ash; White Oak on Red Oak; Largetooth Aspen on Trembling Aspen (and the reciprocal); Willows on Aspens (and the reciprocals); Yellow Birch on Grey Birch. In all cases the stocks were undisturbed wild seedlings. The combinations of Sugar Maple and Red Maple, and Yellow Birch and Grey Birch are of special silvicultural interest since they suggest a possible inexpensive method of improving stands of low value. The references are mainly to Danish and Swedish genetical literature.

[906]. 12.11.22 : 23.27 : 21.61. GERLING, J. **Propagating upright forms of trees.** *Trees, Cleveland (Ohio)* 8 (4), 1948 (16–7, 22).

Bud-grafting is recommended as the easiest, quickest and most reliable method of propagating fastigiate forms of trees for street and ornamental planting. The process is described in some detail.

[907]. 12.11.22 : 12.25 : 12.11.3. DORMAN, K. W. **Breeding better Southern Pines for the future.** *Sth. Lumberm.* 175 (2201), 1947 (147–50).

An account of cross-breeding methods used at the branch forest experiment station, Lake City, Fla., to obtain high-yielding Pines for resin production. A method of rooting cuttings from Slash Pines has also been evolved. Cuttings, consisting of a 5-in. piece of a branch tip from the upper part of the crown, are collected in late October and allowed to stand for 24 hours with their bases in a chemical solution consisting of 25 parts per million of traumatic acid, 25 p.p.m. sodium pentachlorphenate, 10 p.p.m. vitamin B_1, 5% table sugar and 0·4% of a commercial plant food containing essential minerals, vitamins and hormones. The cuttings are then planted in sand beds maintained at a temperature of about 85° F. A fine spray of water is applied for one minute out of every 10. Soon after roots are formed, the cuttings are placed in flower pots, and, when well established, are planted out. By this method it has been possible to root up to 56% of cuttings taken from high-yielding trees.

[908]. 12.11.22 : 12.25. DORMAN, K. W. **Longleaf Pine cuttings rooted in greenhouse.** *J. For.* 45 (8), 1947 (594). [Stheast. For. Exp. Sta.]

In Oct. 1946, 12 cuttings were taken from each of 3 Longleaf Pines [*Pinus palustris*] all of at least 9 in. in diameter; 8 of each set were given chemical treatments that had proved successful with Slash Pine [cf. previous abstract] and the remaining 4 were untreated controls. The most effective treatment was 24-hour soaking of the bases in a solution containing 15 p.p.m. traumatic acid, 15 p.p.m. sodium pentachlorophenate, 10 p.p.m. vitamin B_1, 5% sucrose and 0·4% of a commercial plant food containing essential minerals, vitamins and hormones. Of cuttings receiving this treatment, 38% rooted as against none of the untreated controls.

[909]. 12.11.22 : 12.26–8. TOOLE, E. R. **Rootability of cuttings.** *Amer. Nurseryman* 88 (2), 1948 (72). 3 refs.

Shoots from stem and root cuttings of *Albizzia julibrissin* were placed in flats of moist vermiculite in a greenhouse. Those originating from rootstock rooted on an average in 20 days, by which time those from stemwood had all died. This agrees with previous findings on Honey Locust. [Cf. *For. Abstr.* 6 (9).]

[910]. 12.11.23 : 12.26–8 : 12.14.3. Étude des essences de jachère forestière. **[Study of forest-fallow species.]** *Rapp. Inst. nat. Étude agron. Congo Belge 1944–5*, 1947 (66–7). [F.]

A study is in progress of the comparative weights of the aerial parts and root systems, and the distribution in the soil of the root systems, of 3 species. The aerial parts and the roots of a 5-year-old *Musanga smithii* weighed 466 kg. and 100 kg. respectively; and 95% of the roots of *M. smithii*, 88·1% of the roots of *Cassia siamea*, and 61·9% of the roots of *Annona palustris*, were found in the 0–1 m. soil layer.

[911]. 12.11.23 : 22.2 : 12.11.12. AARON, I. **Growth of stumps.** *Science* 107 (2781), 1948 (391–2). O.R.S.

Presents a hypothesis on the problem of stump growth. Fluctuating temperatures during winter and early spring may initiate enzyme

activity which causes food reserves to become soluble in the swelling foliar initials, differentiating dividing tissue beneath quiescent growing points, and (in secondary tissue) in the phloem parenchyma and xylem ray parenchyma. The process, beginning in the buds where the diameter is small, follows a downward course through the shoots and the bole in the direction of increasing diameter and leads to cell division in the growing points and cambium, and the production and differentiation of primary tissue between the shoot apices. The process could take place equally well in standing trees and stumps, since a multiple of buds is not necessary for its initiation.

12.11.3. *Heredity. Breeding. Hybridization. Races and Questions of Provenance. Cytology*

See also *For. Abstr.* 10 (Nos. 905–7, 952, 1003).

[912]. 12.11.3 (485). ANDERSSON, E. **The Association of Forest Tree Breeding: the Branch Station at Brunsberg [Värmland], Sweden.** *Svensk PappTidn.* 51 (1–3), 1948 (13–18; 33–7; 61–3). [E.] P.R.

An illustrated semi-popular review of the general lines of work in progress. Includes summaries of qualifications for élite status in Scots Pine, Norway Spruce, and Birch.

[913]. 12.11.3 : 12.25 (73). RUDOLF, P. O. **Importance of Red Pine seed source.** *Proc. Soc. Amer. For. 1947*, 1948 (384–98). 3 refs.

Detailed account of a study in provenance of *Pinus resinosa* seed, already reported more briefly. [See *For. Abstr.* 9 (No. 111).]

[914]. 12.11.3 : 12.25 (776) : 23.23.1. RUDOLF, P. O. **Local Red Pine seed develops best plantations.** *Tech. Notes Lake St. For. Exp. Sta.* No. 296, 1948. pp. 2.

Red Pine 1/1 stock of 37 seed origins from the Lake States and New England was planted in furrows on a good soil in N.E. Minnesota. Results after 16 years, given in a table, showed striking superiority of seed of local origin, e.g. 72% survival and 253 cu. ft. volume/acre compared with 58% and 90 cu. ft. for seed of New England provenance, with intermediate values for intermediate provenances.

[915]. 12.11.3 : 12.11.21 : 12.25. LIDDICOET, A. R. ***Pinus* : pollination bag construction.** *For. Res. Notes Calif. For. Range Exp. Sta.* No. 57, 1948. pp. 4.

[916]. 12.11.3 : 12.26–8 (773) : 21.61. MINCKLER, L. S. **Shipmast vs. common Black Locust in southern Illinois.** *Sta. Notes Cent. St. For. Exp. Sta.* No. 45, 1948. pp. [1].

Stock of shipmast Black Locust [*Robinia pseudoacacia*], a strain from Long Island having a superior stem form, showed no superiority in growth and form to local common Black Locust, when planted in the uplands of S. Illinois.

[917]. 12.11.3 : 12.26–8 : 56 : 44.3 : 12.21. BLOW, F. E. **Hybrid Poplar performance in tests in the Tennessee Valley.** *J. For.* 46 (7), 1948 (493–9). 14 refs.

Hybrid Poplar clones originating from the Oxford Paper Co. nursery have been used by the TVA. Clonal differences were evident in growth in nursery trials, and susceptibility to *Septoria musiva* canker is another important point to be studied in test plantings. Ten named clones showed variable 10-year performances ranging from failure of Strathglass to best growth rate for Oxford. The growth, and especially the yield, of hybrid Poplars in these tests were much below those reported in the literature. *From author's summary.*

[918]. 12.11.3 : 12.26–8 : 56 : 57. JOHNSSON, H. Ett par tidnings-urklipp om jätteasp. **[Two newspaper cuttings on the giant Aspen.]** *Skogen* 35 (9), 1948 (107) 4 refs. [Sw.]

Johnsson refutes statements in two articles by B. Lindquist in the popular press, which imply that the giant (triploid) Aspen has little practical value. He presents in evidence: (1) figures for young trial plots laid out by the Forest Tree-Breeding Association, recently published elsewhere [see *For. Abstr.* 10 (No. 78)]; and (2) data given by Petrini [see *For. Abstr.* 7 (No. 2108)] for 3 sample plots of almost mature Aspen at Sätra bruk, Västergötland, of which 2 plots have subsequently been found to represent giant Aspen while the third has the normal diploid type. Petrini's data, which are summarized in a table, show total yields (cu.m./ha.) of 406·2 and 389·1 for the giant, and 298·4 for the ordinary Aspen.

Lindquist's opinion may possibly derive from the unfortunate results of some plantations made with root suckers of giant Aspen distributed in about 1938 from Bosjökloster. This stock was poorly rooted and insufficient attention was paid to site conditions and planting technique, in addition to which the strain was not a good one.

[919]. 12.11.3 : 12.26–8 (73). ATCHISON, E. **Cytogeography of *Gleditsia* and *Mitchella*.** *J. Hered.* 38 (10), 1947 (311–12). 5 refs. O.R.S.

Thirty collections of *Gleditsia triacanthos* and 18 of *Mitchella repens* from various regions of the U.S.A. were examined for evidence of intraspecific polyploidy. No polyploid individuals were found in either species.

[920]. 12.11.3 : 42.22. ASHTON, T. **Technique of breeding for drought resistance in crops.** *Tech. Commun. Bur. Pl. Breed. Genet. Cambridge* No. 14, 1948. pp. 34. 128 refs.

Includes brief references to *Betula*, *Fraxinus*, *Juglans*, *Larix*, *Pinus*, *Quercus*, and *Robinia*.

12.13. Embryology

See also *For. Abstr.* 10 (No. 946).

[921]. 12.13 : 12.25. SWAMY, B. G. L. **Contributions to the life history of a *Cycas* from Mysore (India).** *Amer. J. Bot.* 35 (2), 1948 (77–88). 18 refs. O.B.D.

12.14. Organography. Morphology. Anatomy. Histology

See also *For. Abstr.* 10 (No. 946).

[922]. 12.14.4 : 12.26–8 : 12.11.23 : 24.25 : 24.36. HOLMSGAARD, E. Længdevæksten paa lavtsiddende Bøgeskud, og en Metode til Bestemmelse af sidste Hugstaar. **[Growth in length of low-level Beech shoots, and a method of determining the last year of felling.]** *Dansk Skovforen. Tidsskr.* 33 (6), 1948 (253–60). 1 ref. [Dan.]

Measurements of annual shoot lengths on lateral branches and epicormics of second-storey trees in a 38-year-old Beech stand are tabulated. They show significant differences from year to year which can only be explained as reactions to increased light after fellings [cf. *For. Abstr.* 9 (No. 2089)], though there is a lag, the longer shoots being formed in the second summer after the fellings. Epicormics reacted more strongly and more uniformly than normal shoots on the branches. Further measurements of epicormics and shoots of advance growth in other types of Beech stand confirmed these findings. It was possible in all cases to determine the year of the last felling, and, where sufficiently long, slender shoots existed, that of the 2–3 last fellings. Using this method of dating, the differences in shoot length will usually be obvious without actual measurement. Since bud traces become obscure as the branchlets thicken, epicormics or slender branchlets are the best material to examine.

The same method was tried with epicormics of Oak but was impracticable in this case owing to irregular branching and the presence of lammas shoots.

[923]. 12.14.5 : 12.25 : 12.11.12. HUBER, B. Zur Mikrotopographie der 'Saftströme im Transfusionsgewebe der Koniferennadel. I. Mitteilung. Anatomischer Teil. **[The 'microtopography' of sap streams in the transfusion tissue of conifer needles. I: Anatomy.]** *Repr.* from *Planta* 35 (3/4), 1947 (331–51). 19 refs. [G.g.] [Forstbotanisches Institut, München.] X.

[924]. 12.14.5 : 12.26–8 : 12.11.12. WYLIE, R. B. **Conduction in dicotyledon leaves.** *Proc. Iowa Acad. Sci. 1946*, 53, 1947 (195–201). 5 refs. A.P.B.

A study of the vascular system of dicotyledon leaves suggests that the venation is governed by the necessity for an elaborate distributive system for servicing living tissues rather than by the total carrying capacity of the leaf. *From author's summary.*

12.19. Geographical Distribution. Plant Geography and Sociology

[925]. 12.19 : 02.4. BOR, N. L. **A glossary of terms used in plant ecology.** *Indian For. Rec.* (*n.s.*) *Silviculture* 6 (3), 1947 (93–115).

[926]. 12.19 : 12.25 (713). HADDOW, W. R. **Distribution and occurrence of White Pine (*Pinus strobus* L.) and Red Pine (*Pinus resinosa* Ait.) at the northern limit of their range in Ontario.** *J. Arnold Arbor.* 29 (3), 1948 (217–26 + 3 maps). 15 refs.

[927]. 12.19 : 12.25 (713). HADDOW, W. R. **Check list of stations for White Pine (*Pinus strobus* L.) and Red Pine (*Pinus resinosa* Ait.) at the northern limit of their range in Ontario.** Ontario Dept. of Lands and Forests. 1948. pp. 32.

Supplement to a paper on the subject by the same author. [Cf. preceding abstract.]

[928]. 12.19 : 12.26–8 (44) : 33.32 : 35. PERDRIZET, G. Contribution à la monographie du peuplier tremble—sa répartition sylvicole et commerciale en France. [**Contribution to a monograph on Aspen—its silvicultural and commercial distribution in France.**] *Rev. Bois Appl.* 3 (1), 1948 (12–4). [F.] P.R.

Discusses the geographical distribution of *Populus tremula* in France on the basis of statistics of pulpwood production.

12.19.1. *Regional Floras, including Check Lists*

[929]. 12.19.1 (51) : 12.26–8. P'EI, C. **Flowering plants of northwestern China. I. [Salicaceae and Zygophyllaceae.]** *Bot. Bull Acad. Sinica* 2 (2), 1948 (96–106).

[930]. 12.19.1 (677). GLOVER, P. E. **A provisional check-list of British and Italian Somaliland trees, shrubs and herbs (including the reserved areas adjacent to Abyssinia).** Published on behalf of the Government of Somaliland by the Crown Agents for the Colonies, 4, Millbank, London, S.W.1. 1947. pp. xxviii + 446 — 37 photos, 2 maps. 31 refs.

[931]. 12.19.1 (689). NORLINDH, T., and WEIMARCK, H. Beiträge zur Kenntnis der Flora von Süd-Rhodesia VIII. [**Contributions to the study of the Southern Rhodesian flora [Commelinaceae, Velloziaceae, Flacourtiaceae, Ochnaceae, Melastomataceae, Pedaliaceae and Gesneriaceae].**] *Bot. Notiser* 1948 (1), (17–38). [G.e.] O.B.D.

[932]. 12.19.1 (86). WOODSON, R. E. JR., and SCHERY, R. W. **Flora of Panama. Part V. Fascicle 1. Lauraceae, Hernandiaceae, Papaveraceae, Capparidaceae, Cruciferae.** *Ann. Mo. bot. Gdn.* 35 (1), 1948 (1–106). O.B.D.

[933]. 12.19.1 (88). PULLE, A. [Editor.] **Flora of Suriname (Netherlands Guiana). Vol. 1, part 1, 1932–47 (273–524). Gramineae—Amaryllidaceae—Iridaceae—Triuridaceae—Hydrocharitaceae—Alismataceae—Butomaceae — Portulacaceae.** *Meded. ind. Inst. Amst.* No. 30. (*Afd. Handmus.* No. 11.)

12.19.2-3. *Vegetation Types*

[934]. 12.19.2–3 : 11.1-2. HOLDRIDGE, L. R. **Determination of world plant formations from simple climatic data.** *Science* 105, 1947 (367–8). O.R.S.

Presents a chart by which (given the approximate elevation of the region) types of vegetative formation in dry land areas can be determined from average temperature, precipitation and evaporation values.

[935]. 12.19.2–3 (51). TENG, S. C. **A provisional sketch of the forest geography of China.** *Bot. Bull. Acad. Sinica* 2 (2), 1948 (133–46). **43 refs.**

[936]. 12.19.2–3 (624) : 11.34 : 11.49 : 13.2. MORRISON, C. G. T., HOYLE, A. C., and HOPE-SIMPSON, J. F. **Tropical soil-vegetation catenas and mosaics.** *J. Ecol.* 36 (1), 1948 (1–84). 22 refs.

During an expedition to the S.W. part of the Anglo-Egyptian Sudan in the dry season of 1938–39, data were collected with a view to elucidating the confused soil and vegetation types characteristic of African savanna-woodland country. It was found that the subordinate types could be distinguished, their mutual relationships recognized, and apparent correlations established with factors operating, by the adoption of a general thesis which puts into a precise form the relation between rainfall, topography, and the soil/vegetation complex. Basically the thesis maintains that (subject to certain exceptions) the development of the soil on any site is mainly determined by the local topography through its effect on water movement. Soils are thus divided primarily into 3 complexes: high-level (eluvial), slope (colluvial) and low-level (illuvial), and this division involves the concept of a catena, or topographically determined sequence of soils, embracing soils and vegetation together. This makes possible the formulation of a comprehensive classification of minor and major soil/vegetation units and their relatively easy recognition in the field. Superimposed are the modifying effects of different degrees and lengths of slope

and of different rainfall, producing catena-variants with their own peculiarities of soil detail, floristic content and sometimes dominant species.

The main features of the soil/vegetation catena and complexes in the main tributary-river region and flood plain of the S.W. Sudan are described in detail. The account is based on observations made in many places, supplemented by detail from the study of 3 transects representing the 3 catena-variants distinguished. The pedological, vegetational and floristic records from these transects are given in the last part of the paper. Two general features may be noted in the tables recording the vegetation of the transects: (1) there is a 'drift' of species from the upper to the lower sections of each transect, and (2) the eluvial complex has by far the richest flora. An appendix gives a list of species cited, distinguishing those which occur characteristically on termite mounds. These mounds play an important rôle in the development of eluvial woodland as a whole, in general through interaction with the fire factor, and in particular because they encourage the establishment of *Khaya senegalensis*, which persists as a characteristic dominant of the dense patches of vegetation found on comparatively level sites probably occupied formerly by mounds. *From authors' summary.*

12.19.2. *Forest Types*

See also *For. Abstr.* 10 (Nos. 875, 877, 886, 993).

[937]. 12.19.2 (438) : 12.26–8. SŁAWIŃSKI, W. Lasy bukowe na Wyżynie Lubelskiej. *Fagetum zamosciense*. [**Beech forests on the Lublin uplands. *Fagetum zamosciense*.**] *Ann. Univ. M. Curie-Skłodowska, Lublin (Ser. E)* 1 (1), 1946 (1–100). 161 refs. [Pol.]

A detailed study of the ecology of the Zamosc Beech forests (*Fagetum zamosciense*) on the loess soils of the Lublin Chalk Uplands in Poland, where some parts of the forest remain virgin. The Beech (*Fagus sylvatica*, with an admixture of *Fagus sylvatica* var. *moesiaca*) is believed by the author to be on the retreat owing to the climate's becoming more continental again. The study is based on numerous sample-plot data, including detailed descriptions of the structure of stands, with curves of diameter frequency, of soil profiles with pH values, and of the ground vegetation. Cyclical changes in vegetation due to the interference of man, animals and calamities are are discussed. The author, who is head of the Botanical Institute of the University of Lublin, has added a full bibliography, an index of plant names and an English summary.

[938]. 12.19.2 (438). MATUSZKIEWICZ, W. Zespoły leśne południowego Polesia. [**The forest associations of South Polessia.**] *Ann. Univ. M. Curie-Skłodowska, Lublin (Ser. E)* 2 (5), 1947 (69–138). 5 refs. [Pol.e.] H.S.B.

On the basis of a survey made in 1940, the author distinguishes 20 forest associations in 7 districts of South Polessia, which he groups as follows:—(1) Pine woods, (2) Spruce woods, (3) Pine mixed with deciduous species, (4) mixed deciduous woods, (5) Alder woods, (6) Birch woods. The ecological analysis showed a strict correlation between the vegetation and site conditions.

[939]. 12.19.2 (494) : 12.19.4. ETTER, H. Über die Waldvegetation am Südostrand des schweizerischen Mittellandes. [**The forest vegetation of the S.E. margin of the Swiss plateau.**] *Mitt. schweiz. Anst. forstl. Versuchsw.* 25 (1), 1947 (141–210 + 6 tbls., 1 map). 85 refs. [G.g.f.]

A report on synecological studies of the transition zone between the two climax types *Querceto-Carpinetum* and *Fagetum sylvaticae*, with detailed discussions of the site factors, terminology of successional stages, the forest communities of the zone and their successional relationships, with particular reference to the 'permanent communities' (*Dauergesellschaften*). A map and species lists of the various communities are provided.

[940]. 12.19.2 (498) : 12.26–8. BELDIE, A. Studiul fitosociologic comparativ al fagetelor montane superioare dintre Valea Ialomiței și Valea Buzăului. [**A comparative phyto-sociological study of the upper montane *Fagetum* of the Jalomitsa and Buzau valleys.**] *Abstr.* of thesis, in *Rev. Pădurilor* 63 (2), 1948 (50–1). [Rum.]

The author describes a new association which he names *Fagetum dacicum*, within which he distinguishes four sub-associations (*F. d. normale, F. d. abietetosum, F. d. festucetosum*, and *F. d. luzuletosum*), compares it with the other European types of *Fagetum*, deduces the successional phases of its evolution, and

discusses the practical silvicultural conclusions to be derived from his study.

[941]. 12.19.2 (77) : 11.42.1. **[Replaceable calcium and forest types.]** *Rep. Cent. St. For. Exp. Sta. 1947*, [1948] (6).

Data obtained from a study of 22 virgin-forest soils and adjacent field soils were analysed in order to determine the relationship of replaceable Ca in litter and soil with the distribution of forest types in the Central States region. It was shown that the quantity of Ca does not indicate the type of forest cover to be expected, and also that its concentration in the organic horizon is a result of the moisture in the soil and is only indirectly related to the occurrence and growth of different kinds of forest.

[942]. 12.19.2 (775) : 11.4. WILDE, S. A., WHITFORD, P. B., and YOUNGBERG, C. T. **Relation of soils and forest growth in the driftless area of southwestern Wisconsin.** *Abstr.* in *Bull. ecol. Soc. Amer.* 28 (4), 1947 (47). A.P.B.

[943]. 12.19.2 (776) : 12.26–8. BUELL, M. F., and WILBUR, R. L. **Life-form spectra of the hardwood forests of the Itasca Park region, Minnesota.** *Ecology* 29 (3), 1948 (352–9). 11 refs.

Ten hardwood forest stands in the vicinity of Itasca Park, Minnesota, were sampled and species lists as well as frequency data were obtained for tree, shrub, and herb layers. The forests studied are characterized in the tree layer by a preponderance of *Tilia americana*, *Acer saccharum*, and *Quercus macrocarpa* var. *olivaeformis*. Within the Itasca Park area the character of the flora of the hardwood forests changes along an east-west line, the effect of the prairie margin showing up in the comparison of spectra. Results of comparing the northern Minnesota forests with the mixed mesophytic forest suggest that the species list is not a satisfactory basis on which to build life-form spectra in such a community comparison. Spectra based on frequency points are distinctly different from those based on species lists, both in the climax forests of the Carolina Piedmont and the mixed mesophytic forests on the one hand and the Minnesota forests on the other. In the former the use of frequency points shifts the emphasis to the less protected life-form classes, while in the forests of the Itasca Park region the emphasis shifts in the other direction. The result is such that, through the medium of frequency-point spectra, the Minnesota forests do show the influence of the drier, more continental climate when compared with the mixed mesophytic forests of the southern Appalachians, as well as with the climax forests of the Carolina Piedmont. *Authors' summary.*

12.17.3. *Other Vegetation Types*

[944]. 12.19.3 (46) : 12.26–8. BENITO CEBRIAN, N. DE. Brezales y brezos. Síntesis geobotánica de las formaciones de Ericoideas y resumen monográfico de las especies españolas. **[Heathlands and heathers. A geobotanical synthesis of the formations of Ericoideae and a descriptive summary of the Spanish species.]** *Bol. Inst. for. Invest. Exp. Madrid* 19 (39), 1948. pp. 67. 18 refs. [Span.g.e.]

12.19.4. *Succession*

See also *For. Abstr.* 10 (Nos. 939, 993, 1045).

[945]. 12.19.4 (485) : 12.25 : 57. Skog på 'tundran'. **[Forest on the 'tundra'.]** *Skogen* 35 (11), 1948 (131). [Sw.]

Some stand figures for 150- to 175-year-old Scots Pine and Norway Spruce forest at Viikusjarvi, Karesuando (68° N. lat., 55 km. S. of the N. limit of coniferous forest in Sweden, and at 375–450 m. elevation), are quoted to support the view that neither soil nor climate prevents timber production in the far north, the generally poor condition of the forest being due to the influences of man and fire, which have favoured the spread of Birch, the worst enemy of conifers in this region.

12.2. *Special (Systematic) Botany*

12.25-9. Spermatophyta

[946]. 12.25–9 : 12.13 : 12.14. MAGINI, E. Il riconoscimento delle piantine allo stato giovanile. (A). Il riconoscimento delle piantine di conifere. **[The identification of seedlings in an early stage of development. (A). The identification of conifer seedlings.]** *Ital. for. mont.* 3 (3), 1948 (177–83). [It.] Cf. *For. Abstr.* 10 (No. 114).

[947]. 12.25–9 (410) : 31.0. HOWARD, A. L. **Trees in Britain and their timbers.** Country Life Ltd., London. 1947. pp. viii + 340. 23 refs. Price 25*s*.

General information, history and uses of the trees grown in Great Britain, both indigenous and exotic.

[948]. 12.25–9 (51). CHOW, C. K. **Winter conditions of woody plants in Wei basin.** *Bot. Bull. Acad. Sinica* 2 (2), 1948 (106–26).

Describes and illustrates, with a local key, the winter appearance of 84 species and varieties of deciduous trees and shrubs, commonly found on the loess plain in the Wei Valley.

[949]. 12.25–9 (768). SHANKS, R. E., and SHARP, A. J. **Summer key to the trees of eastern Tennessee.** *Journal of the Tennessee Academy of Science* 22 (2), 1947 (114–33). L.S.

[950]. 12.25–9 (771). DEAN, F. W. **Ohio trees—together with a key to the classes, sub-classes, and groups of evergreen and deciduous trees of Ohio, prepared by L. C. Chadwick.** *Ext. Bull. Ohio Univ. agric. Ext. Serv.* No. 185 (rev.), 1946. pp. 127.

[951]. 12.25–9 : 01.4. WALKER, F. S. **Field identification of trees by multiple entry in a perforated card system.** *Emp. For. Rev.* 27 (1), 1948 (130–3).

The use of keys in identification of trees is discussed, and standard terms suggested for use in a perforated card system, based on diagnostic features that can readily be observed during enumerations in tropical forest. *Author's summary.*

12.25. Gymnosperms

[952]. 12.25 : 12.11.3. FRANCO, J. DO AMARAL. **Um novo abeto híbrido. [A new hybrid Fir.]** *Repr.* from *Portugaliae Acta Biólogica* (*B*) 2 (1/2), 1946 (141–56 + 7 photos + 9 drawings). 10 refs. [Port.e.]

Describes a new hybrid *Abies vasconcellosiana*, believed to be a cross getween *A. pindrow* (♀ parent) and *A. pinsapo* (♂ parent).

[953]. 12.25 (728 : 73) : 47 : 23.27. WOLF, C. B., and WAGENER, W. E. **The New World Cypresses.** *El Aliso* 1, 1948. pp. xiii + 444. Many refs. in text. [Rancho Santa Ana Botanic Garden, Anaheim, Calif.] X.

A study of the genus *Cupressus* in the New World. In Part 1, covering taxonomy and distribution, the author recognizes 15 species as native to the New World, distributed in the western U.S.A., Mexico, Guatemala and Costa Rica. Part 2 deals with injuries and diseases, and chiefly with Cypress canker (*Coryneum cardinale*); Part 3 with experiments in propagation and culture in order to find suitable substitutes for *Cupressus macrocarpa*, previously used extensively for horticultural purposes but found to be highly susceptible to Cypress canker disease.

[954]. 12.25. BASTO, F. X. DE. Quantas espécies de pinheiros existem em todo o mundo? O género *Pinus* Linnaeus. **[How many species of Pine are there in the world? The genus *Pinus*.** *Pinhal e Resina* 1 (3), 1948 (40–7). [Port.e.]

A brief description of the genus and its distribution, with a list of specific synonyms, and classifications by number of needles per bundle, by size of needles, and by cone and seed characteristics.

[955]. 12.25 : 01.2. LOOCK, E. E. M. ***Pinus pinaster* Soland. *versus Pinus maritima* Lam.** *J. S. Afr. For. Ass.* No. 15, 1947 (89–90).

12.26-8. Dicotyledons

See also *For. Abstr.* 10 (No. 1093).

[956]. 12.26–8 (593). FLETCHER, H. R. **Keys to the Siamese species of Myrsinaceae.** *Notes R. bot. Gdn. Edinb.* 20 (98), 1948 (106–20). 7 refs.

13. FOREST ZOOLOGY

See also *For. Abstr.* 10 (Nos. 936, 1429 *et seq.*, 1519).

[957]. 13.2 (672) : 45.3. LEPESME, P. Longicornes de Bukoko. **[Longicorn beetles from Bukoko [French Equatorial Africa].]** *Agron. trop.* 3 (5/6), 1948 (282–6). 13 refs. [F.]

[958]. 13.2 : 13.15. OTTEN, E. Beiträge zur Kenntnis der *Diprion*-Parasiten. 2. Chalcididen als *Diprion*-Parasiten. **[Contributions to the knowledge of the parasites of *Diprion*. 2. Chalcidoids as parasites of *Diprion*.** (Continuation and end).] *Arb. physiol. angew. Ent. Berl.* 9 (3), 1942 (158–69).

56 refs. [G.] *Abstr.* in *Rev. appl. Ent.* 36A (7), 1948 (239). Cf. *For. Abstr.* 6 (48).

[959]. 13.2 : 13.1 : 31.43 : 33.36.1 : 45.3. SNYDER, T. E. **Our enemy the termite.** Constable & Co. Ltd., London. Comstock Publishing Co., Inc., Ithaca, N.Y. 2nd ed. (rev.), 1948. pp. xiii + 257.

A comprehensive and semi-popular account of the habits and life history of termites native to the U.S.A. Information is given on types of damage and on biological and artificial control measures. The new edition contains keys to the genera and sub-genera.

[960]. 13.2 : 13.15. LIGHT, S. F., and WEESNER, F. M. **Methods for culturing termites.** *Science* 106 (2745), 1947 (131–2). 4 refs. [University of California, Berkeley.] O.R.S.

[961]. 13.2 : 13.15. LIGHT, S. F., and WEESNER, F. M. **Development of castes in higher termites.** *Science* 106 (2750), 1947 (244–5). 7 refs. D.S.I.R.

[962]. 13.2. MCGUFFIN, W. C. **New descriptions of larvae of forest insects: *Semiothisa, Dysmigia* (Lepidoptera, Geometridae).** *Canad. Ent.* 79 (6), 1947 (113–6). [Division of Entomology, Department of Agriculture, Ottawa.] O.R.S.

[963]. 13.2 : 13.15 : 45.3 : 41. KENDEIGH, S. C. **Bird population studies in the coniferous forest biome during a Spruce budworm outbreak.** *Biol. Bull. Ont. Dep. Lds. For.* No. 1, 1947. pp. 100. 7 refs.

An application of DDT in an oil spray at the rate of 1 lb./acre in late May and June produced a small, apparently negligible, immediate mortality of birds, but did not affect the size of the total breeding population. Evidence was obtained of a larger bird population at times of Spruce budworm outbreaks than between them. [Cf. *For Abstr.* 10 (No. 1450).]

[964]. 13.2 : 13.15 : 45.11 (676). EDWARDS, L. C. **Some notes on the food of goats in a semi-arid area [in Kenya].** *E. Afr. agric. J.* 13 (4), 1948 (221–3).

Careful observations were made over a period of 18 months to determine how the goat manages to maintain itself in large numbers and excellent condition in semi-arid country covered by deciduous thicket. A list is given of species browsed, classified as AA (extremely palatable), A (palatable), and B (an odd leaf or two snatched in passing). Of the 67 species observed to be eaten by goats, about 60% are AA and A, and about half of these are medium to large trees whose leaves, except for those on the lower branches, would normally be out of reach of browsing goats. During the period of leaf flush, goats were never seen to show the slightest interest in any grasses. In the dry season almost the only green plants are members of the Capparidaceae, many of which are eaten; but the bulk of goat feed at that time is the dry fallen leaves of the species eaten when green; dry pods of *Acacia tortilis* and the winged fruit of *Combretum aculeatum* are also important foods at this season. On only one occasion, and that during the dry season, was a goat ever seen to eat any species of grass, and that possibly inadvertently; nor were goats ever observed eating the bark of a main stem, although young twigs are often devoured, leaves and all.

2. SILVICULTURE

See also *For. Abstr.* 10 (Nos. 854, 869).

[965]. 2 (489) : 12.26–8. DYRING, T. Løvskogens kultur og skjøtsel: inntrykk fra en studiereise i Danmark. [**Silviculture of hardwoods: impressions from a tour of study in Denmark.**] *Tidsskr. Skogbr.* 55 (10/11; 12), 1947 (281–9; 343–62). 12 refs. [Nor.]

Deals chiefly with artificial regeneration and thinning practice, with particular reference to Oak and Beech.

[966]. 2 (493) : 12.25 : 12.26–8 : 5 : 6 : 7 : 11.47.1. ALVIELLA, G. D'. Cahiers forestiers. [**Forestry notebooks.**] Vol. 1, 1947. pp. 507. Vol. 2, 1948. pp. 146 + 404. M. Lamertin, 58–60 Rue de Coudenberg, Brussels. [F.]

These two volumes are in effect a treatise on forestry for the benefit of Belgian foresters. The first 90 or so pages consist of general dialogues on silviculture, followed by sections on:—silviculture and yield of Oak (86 pp.),

Pine (*P. sylvestris, P. nigra, P. pinaster, P. strobus*—110 pp.), Beech (40 pp.), Spruce (60 pp.), exotic species, especially European Larch and Douglas Fir [cf. *For. Abstr.* 9 (No. 2140)], and 'Canadian' Poplar [cf. *For. Abstr* 9 (No. 2133)], all with reference to Belgian conditions. Another 154 pp. are devoted to a general ecological study—'The tree and its environment'. The section on regeneration (80 pp.) includes data on the germinative capacity and viability of seed of the principal forest species used in Belgium. The section entitled 'Yield' (132 pp.), besides covering both physical and financial yield has chapters on surveys and mensuration, management of different kinds of forest and conversion operations. The section on fertilizers and manures (85 pp.) reviews past work in Belgium and includes data derived from recent experiments at Court St. Etienne, in Campine and at Groenendael. At Court St. Etienne a nursery was to be established on a grey sandy soil which had borne 3 successive crops of Scots Pine. Experiments showed that plots which were first limed at a rate of 100 kg./are and then given given an application of $NaNO_3$ (2 kg./are) immediately before planting with one-year seedlings, gave markedly superior results (vigorous plants and 100% survival) at the end of a year compared with (1) liming only (slightly inferior growth), (2) nitrates only (feeble plants and 25% mortality) and (3) neither nitrates nor lime (feeble plants and 50% mortality).

[967]. 2 : 12.25 (795 : 797) : 22.88.2 : 32 : 35 : 47 : 56 : 57. **Management of second-growth forests in the Douglas-Fir region.** Pacif. Nthwest. For. Range Exp. Sta. 1947. pp. iv + 151. 108 refs.

A preliminary handbook, summarizing the present state of knowledge on the subject, and intended to serve as the basis for a more complete and accurate one. There are chapters on the following subjects, each accompanied by a summary and selected references:—growth and yield of young forests in the Douglas Fir region; intermediate fellings; regeneration fellings; rehabilitating poorly stocked and unstocked lands by planting and sowing; protecting the growing stand; logging and marketing. Appendixes include growth by tree class, second-growth volume tables, yield tables, and forest products specifications, for Douglas Fir.

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

See also *For. Abstr.* 10
(Nos. 875, 990, 993, 999, 1046–7, 1479).

[968]. 21 : 12.26–8 : 45.3 : 3. EVREINOFF, V. A. Le caroubier ou *Ceratonia siliqua* L. [**Carob or *Ceratonia siliqua.***] *Rev. int. Bot. appl. Agric. trop.* 27 (399/400), 1947 (389–401). 15 refs. [F.] P.R.

Discusses the geographical distribution of the Carob, its propagation, cultivation and pests, and uses of the fruit as a fodder and for distillation.

[969]. 21 : 12.26–8 : 3 : 47. DETWILER, S. B. **Notes on Honeylocust.** [U.S. Soil Conservation Service.] 1947. pp. 197.

Consists of quotations from publications in the U.S. Department of Agriculture Library and reports in Soil Conservation Service files, with comments by the author. The extracts, roughly classified under major heads and given in full, cover botanical characters, silviculture, utilization and protection of *Gleditsia triacanthos.*

[970]. 21 : 12.26–8. TEMPLER, J. T. **Notes on Mvule (*Chlorophora excelsa*).** *E. Afr. agric. J.* 13 (4), 1948 (210–3).

Notes on preferred soils and meteorological conditions, natural and artificial regeneration, spacing, tending, underplanting, rate of growth, etc. [Cf. *For. Abstr.* 10 (No. 1001).]

21.0. *Adaptability to the General Environment. Acclimatization*

See also *For. Abstr.* 10
(Nos. 1035–6, 1063).

[971]. 21.0 (410). COX, H. A. **Characteristics and requirements of species.** *Wood* 13 (3–5), 1948 (84–5; 113–15; 144–6).

Brief descriptions of the soil and other requirements of exotic coniferous species suitable for timber production in Great Britain.

[972]. 21.0 (44). HIAS, G., and BARRIETY, L. Les essences exotiques dans le Béarn et le pays basque. [**Exotic species in Béarn and the Basque country.**] *Rev. Eaux For.* 87 (3), 1948 (155–75). [F.]

Reviews the results of experimental plantings of a number of species. The most promising of the broadleaved species is *Quercus borealis*,

which at 35 years of age has attained a height of 15–17 m. and average g.b.h. of 50 cm. and is regenerating naturally. It seems very resistant to mildew and to frost injury. Robinia is recommended for light soils and *Liriodendron tulipifera* for moist and fertile sites. *Pinus pinaster*, highly successful on similar soils elsewhere, is a complete failure in this region.

[973]. 21.0 (481) : 12.25. OLLENDORFF, A. Noen ord om grana i Nord-Troms. **[A note on Norway Spruce in N. Troms.]** *Tidsskr. Skogbr.* 55 (10/11), 1947 (273–6). [Nor.]

Norway Spruce, introduced in 1917, grows well in many plantations in various parts of N. Troms, and for several years has borne fully mature seed at these high latitudes. Percentage germinations after 18 days have been 90 for seed from inland districts and 84 for that from the coast. Planting of this species on the better sites is strongly recommended.

[974]. 21.0 (489) : 12.26–8. SABROE, A. S. Tre japanske Løvtræer. **[Three Japanese hardwoods [introduced into Denmark].]** *Dansk Skovforen. Tidsskr.* 33 (3), 1948 (100–7). 3 refs. [Dan.]

The writer, in 1938, received small quantities of seed and raised plants of the following 3 species from the neighbourhood of Sapporo:—

(1) *Kalopanax ricinifolius*: About 50 plants were raised and planted out as 2/1 stock in 1942 in mixed *Quercus borealis*/*Acer* plantations. They have outgrown the Oak and Maple, and a typical tree was 4·5 m. tall in August, 1947. The species appears to require a good soil, rich in nutrients. No frost damage and no dead plants have been seen.

(2) *Cercidiphyllum japonicum*: About 300 2/0 plants were put out in 1940 on a rather poor soil. Only on the moister sites, with some lateral shade, was growth good. The best patch averaged 5·6 m. tall (maximum 6·5 m.) in autumn, 1947. Stem forking was frequent and the plants appear intolerant of overhead shade. No frost damage was noted. The remaining 400 plants did not thrive, as they were planted on too dry a soil and suffered from deer damage.

(3) *Betula maximowicziana*: About 1,000 plants were planted in 1940 as 2/0 stock on 3 different sites. Only on one site was this species successful, but there it had a mean height of 10 m. in autumn 1947. It clearly does best on a rather dry and somewhat acid soil.

Larger-scale trials of these species are recommended. The Birch appears especially promising for lighter soils and the better types of heathland.

[975]. 21.0 (748) : 12.25. COPE, H. N., and CHISMAN, H. H. **European Larch plantation in Pennsylvania.** *For. Leaves* 38 (1), 1948 (6, 10).

From study and measurement of a 65-year-old plantation of European Larch it is concluded that in Pennsylvania this species can be grown to sawlog size on a rotation similar to that needed for native conifers, provided that hardwood competition is controlled by early cultural treatment. It will reproduce itself under favourable seedbed conditions. A large amount of space is needed for adequate crown development. Average d.b.h. and height by crown classes are given, based on 76 trees measured.

[976]. 21.0 (82) : 12.25 : 31.0. ALLHEIMEN, H. Brasil - Araukaria eller 'Pino Brasil'. **[*Araucaria augustifolia.*]** *Tidsskr. Skogbr.* 55 (10/11), 1947 (289–92). [Nor.]

Deals very briefly with characters of the tree, properties and uses of its wood, and habitat. [Cf. *For. Abstr.* 10 (No. 875)]. Mentions a trial in the Patagonian Andes in the Neuquen Province (40° S. lat., alt. 675 m., mean annual temperature 15° C., maximum temperature 30°, minimum rarely below –7° but down to –20°, annual precipitation 1,900 mm., mostly as rainfall but some as snow, summer warm and dry), where 3 years after sowing (1942) *A. angustifolia* was 30 cm. tall as compared with 15 cm. for the native *A. araucana* sown and tended under the same conditions, and mortality was no greater than in the latter species. Suggests that a trial in the milder parts of Norway might be worth while and gives brief notes on direct sowing and nursery practice.

[977]. 21.0 (82) : 12.26–8 : 23.26. WILLIAMSON, J. El eucalipto en la parte central del territorio de la Pampa—comportamiento y producción de ochenta y dos especies en vivero. **[Eucalyptus in the central region of the Territory of the Pampas—behaviour and cultivation in the nursery of eighty-two species.]** *Publ. Divulg. Inst. Fitotec. Argent.* No. 1, 1947. pp. 31. [Span.]

The result of experiments in progress since 1925 at the Estación Experimental Nacional de General Pico. In order to find species of Eucalypt suitable for the Territory of the Pampas, Argentina, observations were recorded on the development of over 80 species, some raised from stock already in the territory and others from seeds obtained directly from Australia. Notes on nursery methods are included.

[978]. 21.0 (922) : 12.26–8. VERHOEF, L. *Cedrela mexicana* M. Roem. sebagai pohon kajoe jang dipenoesahakan. [**Cultivation of *Cedrela mexicana* in Indonesia.**] *Korte Meded. Boschbouwproefsta. Buitenzorg* No. 80 [*n.d.*] pp. 11 – 2 photos, 1 drawing. 8 refs. [Jav.e.] P.R.

Four plantations of *Cedrela mexicana* established in Java have shown, during the first 2 years, rapid growth, resistance to attack by the shoot borer, *Hypsipyla robusta*, and more resistance to drought than was expected.

[979]. 21.0 (943) : 12.25. **Exotic Pines.** *Aust. Timb. J.* 14 (4), 1948 (210).

Growth rate of the exotics *Pinus taeda* and *P. caribaea* in Queensland, after initial difficulties with seed germination and stunted development, is now reported to surpass that of the same species in their natural habitat. Thinnings of plantations of 8 years old and upwards have provided a considerable amount of timber for the container industries.

21.8. *Phenology*

[980]. 21.8 : 12.26–8 (675). Phénologie. [**Phenology [of *Afrormosia elata*].**] *Rapp. Inst. nat. Étude agron. Congo Belge 1944–5*, 1947 (24–5). [F.]

Summary of data on leaf fall, flowering and fruit production, collected over a period of 7 years.

22. SILVICULTURAL SYSTEMS. FORMS OF STAND

22.1. *High Forest Forms*

See also *For. Abstr.* 10 (Nos. 992, 994, 1248).

[981]. 22.1 : 12.25 (776) : 23.1 : 24. EYRE, F. H., and ZEHNGRAFF, P. **Red Pine management in Minnesota.** *Circ. U.S. Dep. Agric.* No. 778, 1948. pp. 70. 39 refs.

Experiments in the management of *Pinus resinosa* have been in progress for a number of years. The results here presented cover (1 seed-tree felling, (2) two-cut shelterwood, and (3) a more intensive system with frequent thinnings and light improvement fellings followed by partial harvest fellings (80–120 years) and then shelterwood fellings. The last of these systems is much superior to the others. Shelterwood fellings are recommended at about 120 years of age; they should, if possible, be made in a good seed year, which occurs on an average about once in 4 years. If brush is heavy, scarification with an Athens disk plough and supplementary planting may be necessary. By keeping the stand fairly open during the later years of the rotation, advance growth can develop and the overstorey is able to maintain good growth until an age of about 140 years, when the final cut should be made. *From authors' summary.*

[982]. 22.1 : 12.25 (78). LEBARRON, R. K. **Cutting Lodgepole Pine in the Northern Rocky Mountains.** *Proc. Soc. Amer. For. 1947*, 1948 (399–403).

Recommendations for cutting practice in Lodgepole Pine stands of the northern Rocky Mountains. It is not intended that they should be applied in other regions where conditions are different. In general, clear cutting in small blocks (less than 50 acres), interspersed with uncut blocks of equal size is recommended. The blocks should be irregular in shape, fitted to the topography and to variations in the timber stand. If market conditions preclude clear cutting, selective cutting should be kept light enough to prevent reproduction coming in.

[983]. 22.1 : 12.25 : 32 : 24. **An experiment in logging a 90-year stand.** *Timberman* 49 (7), 1948 (44–6, 112, 114).

The first large-scale logging experiment in the Douglas Fir region, in which the U.S. Forest Service and commercial firms are cooperating, has begun in Cascade Head Experimental Forest on the Oregon coast. Five tracts in the 90-year-old second-growth stands of Hemlock and Spruce are being subjected to different types of felling operation, and a study of methods in crop-tree thinning, salvage thinning, progressive strip-felling, high-lead clear-felling and reducing wind-throws will be made. A short preliminary account is

given of the experiments in progress and the equipment in use.

[984]. 22.14.2 : 23.1 : 22.83 : 12.25. Boe, K. N. **Composition and stocking of the young stand 35 years after a selective cutting in Ponderosa Pine.** *Res. Notes Nth. Rocky Mt. For. Range Exp. Sta.* No. 63, 1948. pp. 6.

A study made of a stand on the Bitterroot National Forest. The stand, before cutting from 1907 to 1911, was composed of 90% Ponderosa Pine and 10% Douglas Fir by volume. A reserve stand of 5—50% of the original volume was left; all merchantable Douglas Fir was cut. The following results are noticeable: (1) on northerly aspects, Douglas Fir attained a dominant position in the young stand and although numerous Pine stems exist, they will not form the principal species in the final crop; (2) southerly aspects are more favourably stocked with Ponderosa Pine, but there is an apparent increase of Douglas Fir as compared with the original stands; (3) logging improved conditions for establishment of reproduction; (4) good seed crops coincident with cutting operations appeared to aid prompt regeneration.

22.2. *Coppice Forest*

[985]. 22.21 : 12.26–8 (669). [***Eucalyptus robusta* grown as coppice with standards.**] *Rep. For. Adm. Nigeria 1946–7*, 1948 (12).

It is reported from the mountain grasslands of eastern Nigeria that selective felling under the light shade of a *Eucalyptus robusta* plantation, 50 ft. high, produced most promising growth and may allow of a system of coppice with standards.

22.8. *Silvicultural Description of Forms of Stand*

[986]. 22.8 : 12.26–8 (771). Diller, O. D. **Forest condition classes as applied to Central hardwoods.** *Proc. Soc. Amer. For. 1947*, 1948 (404–10).

The customary classification used to describe condition and stocking (sawtimber, pole timber, seedling and sapling, and non-stocking) is too general for application to intensively managed farm woodlands, and accordingly 8 'condition classes' are recognized which take account of the grazing effect as well as density and type of stocking.

[987]. 22.83 : 12.25 : 56. Épicéa—peuplement remarquable. [**A remarkable stand of Spruce.**] *Bull. Soc. for. Belg.* 55 (4/5), 1948 (178–9). [F.]

A plantation of Scots Pine and Norway Spruce in mixture was made in 1860. The Spruce was suppressed by a heavy growth of heather during the first 15 years. Later, a series of light thinnings removed the Pine, leaving a pure stand of Spruce. During the last decade (76th to 86th years) the rate of increment has been 3·18% and the rate of interest 4% p.a., which are very high for such an age.

23. FORMATION OF STANDS

[988]. 23 : 07.7 : 32.25 : 32.9 : 38.3. Redskabsfremvisningen paa Frijsenborg Skovdistrikt den 24. Oktober 1947. [**Demonstration of implements in Frijsenborg Forest District, 24 Oct. 1947.**] *Dansk Skovforen. Tidsskr.* 33 (2), 1948 (61–81). [Dan.] Cf. *For. Abstr.* 8 (No. 1737).

Brief descriptive notes, some accompanied by photographs, on the implements demonstrated. These included various soil cultivators (rotary types, disk and other types of harrow); tractors (including a 5-h.p. horticultural model used for nursery work); a transplanting machine; three types of power saw (all petrol-driven chain types) and an electrically operated chain grinder; a hydraulic log lifter; skidding wheels and trailers for firewood; a truck-mounted loading crane; and miscellaneous equipment, e.g. a hydraulic loading scoop, designed for use with a tractor, for handling road materials etc.

[989]. 23 : 07.7 : 76 (489) : 32.9. Petersen, B. H. Rationalisering: er Mekanisering et Middel til yderligere Rationalisering af dansk Skovbrug. [**Is mechanization a means to further rationalization in Danish forestry?**] *Dansk Skovforen. Tidsskr.* 33 (5), 1948 (173–95). [Dan.] [A lecture, with discussion.]

During the year 1946–47 a motor truck acquired by the Gjorslev Forest District and used for extraction and transport at current maximum prices, showed a loss of kr. 5,800 (excluding capital investments). The District's total traction requirement per annum (for extraction and transport of wood, carrying

road gravel, plantation weeding, transport of plants, ploughing, etc.) is 698 'team days' plus 434 man-days for extra help; this requires 3 teams of 2 horses each, the total costs are kr. 43,812 and the receipts kr. 27,940, giving an annual deficit of some kr. 16,000 for an average of 233 working days per team per year. Attention was therefore turned to the tractor and a wheeled type was chosen to give the necessary speed of delivery to the District's own sawmill, which takes about one-third of the outturn of of the forest. In spring 1946 a modern 25-h.p. pneumatic-tyred tractor, starting on petrol and running on paraffin, was bought. This machine was equipped with a power lift, operated from the driver's seat, which has been extremely useful for lifting the implements drawn (e.g. harrows) clear of obstacles.

Comparison of costs shows that with 250 effective working days per year the daily costs (including amortization) are kr. 46 for tractor and driver and kr. 44 for 2 horses and driver. The tractor has a great advantage in its low cost for idle days.

Horses were given up in spring, 1947, and a second tractor acquired in November of that year. In the first half of 1947–48, operation with tractors has yielded a surplus of kr. 4,000. From experience gained to date, a table of time and costs is presented for 2 tractors working on extraction and transport of wood, firewood cutting, silvicultural and some agricultural operations. Total costs are calculated as kr. 28,600 and receipts as kr. 36,240, giving a surplus of kr. 7,640 per annum (an advantage of about kr. 24,000 over operation with 3 horse teams) and leaving about 100 tractor days still available for any suitable use. Brief notes are included on various individual operations in the categories mentioned above. Experience with a 6-h.p. petrol driven rotary cultivator, having knife cutters (with a sliding coupling to prevent jamming against obstacles) and 3 forward gears, is also reported in brief. This machine has been used for plantation weeding in places where tractor work is difficult (e.g. small, comparatively inaccessible areas), for making drills in direct sowings, and for nursery work. For a single cultivation on each side of plantation rows, performances have varied between about 1 ha./day (petrol consumption 1 litre/hour) and 0·3 ha./day (petrol consumption 2·1/hr.), according to site conditions. The life of the machine is estimated at 2,000 working hours, and costs per day (including amortization and operator's wages) at kr. 46. The average cost of weeding was formerly about kr. 80/ha., whereas with tractor-drawn implements, under suitable conditions, 6 ha./day can be weeded for a cost of about kr. 8/ha.

A theoretical calculation of costs and savings with power saws is also included. These have not been used in the District, enough labour having been available for logging work.

In discussion, the Jægerborg District was stated to have had good results with the (petrol-driven) Disston power saw, which cut at a rate of 62 sq. cm./sec. and gave total costs of slightly over kr. 1·00/cu.m. of timber cut. The saw was hired out to the workers by the management.

[990]. 23 : 12.25 : 21. HOLT, L. **Jack Pine regeneration in Eastern Canada.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 42 (F–2), 1948. pp. 13. 50 refs.

A summary of the literature on *Pinus banksiana*, with special reference to its regeneration after clear cutting.

[991]. 23 : 12.26–8 (54). **The natural and artificial regeneration of Teak.** *Proc. 6th silv. Conf., Dehra Dun 1945*, 1947 (71–84).

Nine papers describing current methods and opinions on Teak regeneration in different provinces, together with a summary of the debate leading to a resolution in favour of a co-operative tour.

23.1. *Natural Regeneration*

See also *For. Abstr.* 10 (Nos. 903, 981, 984).

[992]. 23.1 (669) : 22.12 : 24.31. **Natural regeneration.** *Rep. For. Adm. Nigeria 1946–7* 1948 (12–13).

High-forest regeneration operations under the tropical shelterwood system with poisoning of the middle storey are being extended. It has been established that advance growth, as distinct from induced seedling regeneration, responds to increased light. The death rate among induced regeneration is high on account of competition by monocotyledonous growth which derives great impetus from the increased light. Experience to date indicates that the first climber cutting should be much more thorough, and that the first poisoning should be heavier.

[993]. 23.1 : 12.25 (494) : 12.19 : 21.1 : 21.2. AUER, C. Untersuchungen über die natürliche Verjüngung der Lärche im Arven-Lärchenwald des Oberengadins. **[Investigations on the natural regeneration of Larch in the Cembran Pine/Larch forest of the Oberengadin.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 25 (1), 1947 (7–140). 64 refs. [G.g.f.]

This study, which was limited to the *Rhodoreto-Vaccinietum* of the upper Oberengadin, deals with the influence of management on the present distribution of Larch [*Larix decidua*], correlations between plant succession and the natural regeneration of Larch in the association named, microclimatic factors of sites where Larch seedlings appear as the pioneer tree seedlings, experiments on the effect of individual factors (e.g. light, moisture, frost) on germination and seedling development, and the silvicultural inferences to be drawn from the results obtained.

Larch is shown to be decreasing and Cembran Pine increasing in the region. A natural explanation is found in the fact that effective germination of Larch seed, even in the early stages of succession, is impeded by a combination of factors. Larch has a pronounced capacity for colonizing immature soils, and succession proceeds from almost pure Larch through a mixed Larch/Cembran Pine stage to pure Cembran Pine. Investigation of sites where Larch seedlings are natural colonists showed that even on immature soils a special microclimate is required, characterized by locally increased moisture and light shade. This conclusion was verified experimentally, and the experimental results afforded useful indications of the quantitative relationship between site factors on the one hand and the chances of successful regeneration on the other. Moisture was clearly the dominant factor, though light was also important. The effect of edaphic factors on germination remains obscure.

For continued regeneration of Larch, the natural succession must be set back, e.g. by scarification of the soil. Single-tree selection encourages the elimination of Larch, and the conversion of stands managed under this system to some system of felling by coupes, preferably on the lines of the group and irregular shelterwood systems (Swiss *Femelschlag*), should be undertaken.

Though the results are directly applicable only to the association in question, it is presumably generally true that adequate moisture and exposure of the mineral soil are always important conditions for the regeneration of this species.

[994]. 23.1 : 12.25 (712.1) : 22.83 : 22.12.1. BEDELL, G. H. D. **White Spruce reproduction in Manitoba.** *Silv. Res. Note For. Serv. Can.* No. 87, 1948. pp. 16. 8 refs.

A regeneration survey was made in the Duck Mountain Forest Reserve in July and August 1947, to study reproduction after felling by the shelterwood and seed-tree systems in mixed stands of Spruce [*Picea glauca*] and hardwoods. Stocking, including all species, was satisfactory after felling by either system. Spruce regeneration, however, was sparse or lacking over a large portion of the area, though 65% of the shelterwood area showed an increase in the percentage of quadrats occupied by Spruce. The felling method is not the only influence on the amount of Spruce regeneration secured. There is some evidence that the lack of Spruce regeneration may be due to insufficient moisture and excessive depth of litter and humus. It is suggested that future experiments should investigate the effects of seedbed improvement, by ploughing, and the effects of lopping and scattering brush instead of burning it. *From author's summary.*

[995]. 23.1 : 12.26–8 (421–8). JAMES, N. D. G. **Natural regeneration [of Beech].** *J. Land Agents' Soc.* 47 (7), 1948 (167–9).

The 4 necessary conditions for natural regeneration of Beech in England are defined as (1) absence of rabbits, (2) a supply of seed, (3) a suitable seedbed, and (4) sufficient light for the growth of young seedlings. It is suggested that one of the reasons for the well-known power of self-reproduction of the Chiltern Beechwoods may be the unrestricted access enjoyed by the public, which discourages rabbits and often results in fires that destroy the thick layer of litter and expose the mineral soil. Some form of light harrowing is recommended.

[996]. 23.13 (541) : 23.53. **Natural regeneration.** *Rep. For Adm. Assam 1945–46*, 1948 (25).

Current practice in natural regeneration of Sal and evergreen species in Assam is what is known as 'aided natural regeneration' where

natural seedlings do not appear in sufficient numbers. For Sal, this consists in broadcasting seed in strips in regeneration areas, and subsequent tending; for *Phoebe goalparensis* the method is direct sowing and transplanting under the natural canopy. In the *Mesua* Dipterocarp type of evergreen forest in Upper Assam, tending alone is necessary, with no need of sowing or transplanting.

[997]. 23.13 : 12.25 : 43.11. CHAPMAN, H. H. **The initiation and early stages of research on natural reforestation of Longleaf Pine.** *J. For.* 46 (7), 1948 (505–10). 7 refs.

A review of research in the natural regeneration of *Pinus palustris* during the last 35 years, with a summary of the conditions now generally accepted as essential:—(1) all competition by brush and other trees to be reduced by cutting and burning; (2) burning must be done before seed fall, preferably during the preceding winter; (3) winter burning must be carried out in the 3rd and 5th years to eliminate brown-spot disease and competing vegetation; (4) fire must then be excluded until the crop is above 3 ft. in height, after which winter burning can be resumed at 3- to 5-year intervals throughout the life of the stand, as a protection against destruction by hot summer fires; (5) where seed trees are inadequate and planting is necessary, fire should be used in the same way. [Cf. *For. Abstr.* 9 (No. 1874).]

[998]. 23.13 : 12.25 : 43.11. CHAPMAN, H. H. **How to grow Loblolly Pine instead of inferior hardwoods.** *Proc. Soc. Amer. For. 1947*, 1948 (347–53).

In order to enable *Pinus taeda* to compete successfully with invading hardwoods, it is necessary to give them an even start, when they will soon overtop hardwood seedlings and sprouts. The method recommended is clear felling, leaving an adequate supply of seed trees, followed by poisoning and/or girdling of the larger hardwoods, and burning to kill the smaller ones and expose the mineral soil (a necessary condition of regeneration of this Pine). In order to preserve the seed trees from damage by fire, all slash must be removed to a distance of 6–8 ft. from the bole. For best results, both the felling and girdling and the burning should take place in late August or September, before the fall of seed, the fire being as severe as safety allows. If logging takes place in poor seed year, burning should be done as indicated, followed by a repeat burn in the summer of the next full seed crop.

23.2. *Artificial Regeneration*

See also *For. Abstr.* 10 (No. 1065).

[999]. 23.2 (945) : 23.21 : 21. FERGUSON, K. V. M. **Selection, propagation and planting of trees in the country districts of Victoria.** *Leafl. For. Comm. Vict.* No. 3, 1945. pp. 47 + map.

Notes on choice of species and methods of planting for different districts of Victoria, according to the amount of rainfall.

[1000]. 23.2 : 12.26–8 (81). VEIGA, A. DE A. Consideracões gerais silvícolas—*Acacia mollissima*. [**General silvicultural problems—*Acacia mollissima*.**] *Rev. Agric., Piracicaba* 22 (11/12), 1947 (316–22). [Port.] A.C.P.

Preliminary notes on experiments in propagating *Acacia mollissima* in the Horto Florestal de Batatais. Seeds were placed in hot water for 2 or 3 minutes before sowing in seedbeds. Germination took place in 5 or 6 days and seedlings were pricked out 10–30 days after. Best results were obtained with fresh seeds or with those kept 6–8 months in a dark and well aired storage place. Direct sowing was less successful than transplanting seedlings 22 to 40 cm. high, with a ball of earth round the roots.

[1001]. 23.2 : 12.26–8. KAUMA, E. **Short notes on nursery and planting technique at Abera timber plantations, Acholi district, Uganda.** *Emp. For. Rev.* 27 (1), 1948 (76–9).

Deals with *Chlorophora excelsa* [cf. *For. Abstr.* 10 (No. 970)], *Khaya grandifoliola*, and *Phyllanthus discoideus*.

23.23. Seed and Sowings

See also *For. Abstr.* 10 (Nos. 913–4, 1021).

[1002]. 23.23 : 12.25 : 23.6. RAVITZKY, B. **Direct sowing of Aleppo Pine.** *Forest, Jerusalem* No. 1, 1947 (7–9). [Heb.]

Experiments in direct sowing of Aleppo Pine (*Pinus halepensis*), undertaken by the Government Forestry Department in the Nazareth hills and Carmel in 1927–28, 1931–32 and 1945–46, indicate the following procedure:—

(1) *Soil preparation*: ploughing before or after the first rains to a depth of 20–25 cm. in strips or patches, according to terrain and vegetation; strips at 2-m. intervals and 75–100 cm. wide (terraced on steep slopes), patches 100 × 100 cm. and 2 m. apart. (2) *Seed collection*: Pines 8–10 years old give excellent seeds and large quantities can be obtained locally at low cost. Cones can be collected from early summer to October and do not need drying. Some 5 tons of seed, sufficient to sow 2–3,000 dunam, are available each year in Palestine. (3) *Sowing*: from mid-November to the end of January (i.e. after the earlier rains) and earlier on light soil and southern slopes, later on clay soils and cool aspects; in rich, weed-infested soil, best to sow after weeds have come up and been weeded, to give the seedlings a good start. Sow thickly (1 kg. in patches and 1—2 kg. in strips, per dunam of 0·23 acres), cover the seed lightly and firm the soil by hand. The heavier the soil, the lighter the covering. The beds must at once be protected from rodents, birds, desiccation etc. with cut branches kept wind-firm by stones or by sticking into the ground, and not thick enough to harm the growing seedlings. (4) *Germination*: in favourable weather begins after 15–20 days, and with good seed is high. All grass should be carefully pulled up, but other weeding is better left until the seedlings are established. (5) *Tending*: weed and hoe 2–3 times in the 1st winter and summer, gradually removing the branch-cover, and thin to 5–15 cm. apart, preferably by cutting the unwanted seedlings with shears. At a year the best seedlings should be 25–30 cm. high, average 10–18 cm. In the 2nd year, weed and hoe twice, again thin to at least ½ m. in strips or to 2–3 seedlings per patch, and re-sow failures.

Direct sowing requires a minimum of skilled labour, is cheaper than planting, does not depend on cloudy, damp weather, and hence can be done over a fairly long period of the year.

The importance of these experiments lies in the fact that, despite a recent tendency to introduce many other species, the Aleppo Pine remains the most valuable forest tree in Palestine and plans for its extensive use in afforestation by both Government and the Jewish National Fund demand the discovery of cheaper methods of formation. [Cf. *For. Abstr.* 10 (No. 1038).]

23.23.1. *Seed Procurement, Treatment, and Testing*

See also *For. Abstr.* 10 (Nos. 913–4, 1429).

[1003]. 23.23.12 : 12.25 (411–4) : 12.11.3. Steven, H. M. **Improvement in practice: selection of tree seed.** *Scot. For.* 2 (1/2), 1948 (19–26).

Stresses the importance of collecting seed from the best strains, particularly for such variable species as Scots Pine and European Larch, and indicates the qualities to be looked for in parent trees of the more important coniferous species in Scotland.

[1004]. 23.23.12 (54). Kermode, C. W. D. **Co-operative seed collection and distribution.** *Proc. 6th silv. Conf., Dehra Dun 1945* 1947 (51–5). Together with 11 short papers on the position in various states and provinces of India (55–8) and a summary of the debate (58–60).

[1005]. 23.23.15 : 44.3 : 12.25 : 12.21 : 23.26.4. Delevoy, G. Note sur un essai de traitements préventifs du sol et des graines résineuses, contre la fonte des semis. [**Note on a test of preventive treatments of the soil and of conifer seeds, against damping off.**] *Bull. Soc. for. Belg.* 55 (7), 1948 (238–43). [F.]

Report on experiments made at the Groenendael nurseries in 1939–40, which included treatment of the seedbed, before sowing, with formic acid and acetic acid, and treatment of seed (1) by dusting with Graineol (basic acetate of copper), and (2) by soaking in a solution of a heteroauxin (naphthalene-acetic acid). Under the conditions of the experiment, both treatments of seed proved harmful, and these harmful effects were aggravated by both the soil treatments, except that acetic-acid treatment of the soil appeared to mitigate the harmful effect of the heteroauxin treatment of Spruce seed. Formic-acid treatment of the soil appeared to be efficacious in protecting untreated Spruce seed.

[1006]. 23.23.19 : 12.26–8. Heit, C. E. **Physiology of germination.** *Rep. N.Y. St. agric. Exp. Sta. 1947*, 1948 (49–50).

White Ash [*Fraxinus americana*] embryos, when excised to determine viability, showed quicker root development and more greening of the cotyledons when a 0·2% solution of KNO_3 was added to the substratum than when

water was used; the results were 92 and 56% germination respectively. Seeds of *Platanus acerifolia* required a 20 to 30° C. temperature alternation for maximum germination. Prechilling was not necessary for obtaining complete germination.

[1007]. 23.23.19 : 12.26–8. [**Germination tests.**] *Rep. For. Adm. Assam 1945–46*, 1948 (26).

Tests on the germination of Hollock (*Terminalia myriocarpa*) seeds gave 20–30% germination.

[1008]. 23.23.19 : 12.26–8. JOHNSON, A. G. **Seed quality of the Chinese Tulip tree.** *J. For.* 46 (6), 1948 (459).

Sound seed from a 500-seed sample of *Liriodendron chinense* amounted to 19·4%, a striking approximation to the figure for *L. tulipifera* (19·08%).

[1009]. 23.23.19 : 12.26–8 : 23.23.15. [**Germination of Mvule.**] *Rep. For. Dep. Tanganyika 1946*, 1948 (17).

Germination tests on seed of *Chlorophora excelsa* gave 98% germination with fresh, 66% with year-old, and 7% with 2-year-old seed.

[1010]. 23.23.19 : 12.29 : 12.11.23. GOMES, R. P. A germinação da carnaubeira [**Observations on the germination of *Copernicia cerifera*.**] *Rodriguésia* 10 (20), 1946 (1–5). [Port.]

23.23.3. *Methods of Sowing*

See also *For. Abstr.* 10 (Nos. 1022–3).

[1011]. 23.23.3 : 07.7. COINCY, A. DE. Un nouvel appareil d'ensemencement. [**A new sowing gun.**] *Rev. Eaux For.* 87 (3), 1948 (151–4). [F.]

Description of the walking-stick-type Latour sowing gun and its use for direct spot sowing which, it is claimed, reduces the consumption of seed from 5 to 1 kg./ha. In sowing burnt-over areas to *Pinus pinaster* it is possible at the same time to sow seed of Broom, which provides protection to the seedlings and improves the soil. The distributory mechanism is designed to sow 3 seeds of *P. pinaster* on each spot.

[1012]. 23.23.3 : 12.25 : 23.3. [**Direct sowing of *Widdringtonia whytei*.**] *Rep. For. Dep. Nyasald. 1946*, [1948?] (7).

In the 1945–46 rainy season, some Mlanje Cedar (*Widdringtonia whytei*) was sown broadcast on an area of burnt-over evergreen forest in Nyasaland. Germination was profuse and growth has so far been excellent. If this experiment is successful, it should be possible to regenerate all cut-over areas by a mixture of natural seeding and broadcast sowing, planting being confined to extensions outside natural forests. For this last purpose, trial plantings of *Pinus patula* are now being made, with the object of discovering whether this frost-resistant species can be used as a nurse crop for the frost-tender Cedar.

23.24. Formation of Stands by Planting

See also *For. Abstr.* 10 (Nos. 1024–5, 1039, 1040, 1487–90).

[1013]. 23.24 (410) : 76.1. **Contract planting.** *Wood* 13 (6), 1948 (164–6).

Since the formation of a Forestry Section of the Federated Home Timber Associations [see *For. Abstr.* 9 (p. 260)], an increasing number of merchants undertake to do early replanting on and they have felled over. An account is given of the operations of one such firm, with figures for the costs per acre of fencing, planting, cleaning (1st and 2nd years) and beating up (1st and 2nd years) for two different cut-over areas; both were planted with European Larch and Oak but owing to differences in the amount of tending necessary, the total cost of one was £54 14*s.* and of the other £69 per acre. It is, however, concluded that such undertakings are economically practicable.

[1014]. 23.24 : 12.25 (411–4). LILBURN, W. **An amateur forester gains experience.** *Scot. For.* 2 (1/2), 1948 (34–7).

The author retails his experience in establishing Scots Pine plantations on fairly well drained moorland at a moderate elevation with ground cover exclusively of *Calluna*. Experiments with notch planting of 2/2 planting stock in spring resulted in 50% mortality. Similar planting in the autumn gave 90% survival. These transplants, however, did not make much progress till the 3rd year. Use of 2/1 stock gave good results when the heather was short, but needed much beating up where it was long. An experiment was then tried of burning the planting site twice over in order to destroy

all heather and moss, and then planting 2/0 seedlings. This proved extremely successful, and effected a great reduction in planting costs, but the young trees were destroyed by hares, which got into the rabbit-proof enclosure during a snowstorm. A modified plan has now been adopted; where heather is not too rank, 2/1 transplants are used, and where it is old and rank, the site is burnt 4 years before planting, also with 2/1 stock. It is found that 4×4 spacing, which produced rapid growth and early closing of canopy, also resulted in severe snow bend; 5×5 spacing has now been adopted, and promises to be satisfactory.

[1015]. 23.24 : 76.1 (489). MØLLER, C. M. Vokser Kulturudgiften vildt? **[Are planting and establishment costs running wild?]** *Dansk Skovforen. Tidsskr.* 33 (2), 1948 (33–47). 9 refs. [Dan.] With comments by J. Abell and reply by Møller in *Dansk Skovforen. Tidsskr.* 33 (4), 1948 (150–65).

Møller argues that, especially for Beech, the question of reducing such costs has been much neglected in Denmark. He refers briefly to Danish and other successes with direct sowing and natural regeneration of Beech, claiming that this species is easy to regenerate on the good sites where it has the best chance of competing —economically and otherwise—with other trees. In replies to various comments by Abell, he again stresses that proper choice of species is a material factor in reducing costs. Where Beech regeneration cannot be obtained cheaply, pure Beech should be replaced by mixtures, e.g. by Ash or possibly Maple on the better, and Larch or possibly Douglas Fir on the lighter soils. Questions of interest and net financial returns cannot be ignored when planning regeneration work.

23.24.2. *Methods of Planting*

[1016]. 23.24.2 : 07.7. **New tree planter.** *Canada Lumberman* 66 (19), 1946 (35).

Description of a machine developed by the Grand River Conservation Co. in Ontario from the Michigan planter [cf. *For. Abstr.* 8 (No. 240)] and mounted on a uni-carrier designed so that several implements may be attached for several operations. A double-mouldboard plough, to the bottom of which a metal shoe is welded, is attached beneath the uni-carrier. The shoe serves to open a trench 9 in. deep in the bottom of the furrow. The operator sits in the machine and places the trees in position immediately after the earth has been opened; soil flowing back into the furrow sifts round the roots in a natural manner so that they do not pack or tangle; pressure plates attached behind force the remaining earth back into position and 2 rear wheels pack the earth down firmly. Operated by 3 men, the machine can plant from 1,000 to 1,500 trees an hour, handling trees up to 30 in. high. A particular advantage is that the 15-in. furrow reduces danger of smothering from subsequent re-growth of grass.

[1017]. 23.24.2 : 12.26–8 (595). **Bamboo planting tubes.** *Malay. Forester* 11 (3), 1948 (126–7).

The use of Bamboo planting tubes, 4–6 in. in diameter and 6–8 in. long, often attracts the attention of wild pig and white ants which may also damage the seedlings. A new method uses small tubes, 4 in. long and 3–4 in. in diameter, split in halves before filling and then bound with string or cotton. At the planting site the tubes are opened and the cylinders of earth containing the seedlings removed and planted. The tubes are collected for further use. Owing to their small size, the cost of transport to the planting site is much reduced. Up to 90% survival is said to have been achieved in Malacca by this method, using 4- to 8-leaf jungle seedlings of *Shorea leprosula* potted about 2 months before the field planting under 2-year-old secondary growth. In an experiment at Kepong, using 10-month-old nursery stock of *S. leprosula* planted out under 2- to 3-year-old secondary growth, survival after 3 months was as follows:—large tubes 78%, small split tubes 69%, naked-rooted seedlings 22% (of which about half had still not put out any new leaves). Small split tubes have also been used for planting 9-month-old *S. pauciflora* in an area where naked-rooted seedlings had failed almost completely a few months previously. Survival after 4 months was 50%.

23.24.3. *Spacing*

See also *For. Abstr.* 10 (No. 1046).

[1018]. 23.24.3 : 12.25 (481) : 57 : 33.32. HASLUND, O. Granskogens produksjon og kvalitet. **[Yield and quality of Norway Spruce woods.]** *Tidsskr. Skogbr.* 55 (12), 1947 (333–5). [Nor.]

Deprecates Klem's tendency to generalize the results of the Fossum Verk trials [see *For. Abstr.* 9 (No. 2184) where, under *Taper*, for [cm. per m.] read [mm. per m.]]; stresses the importance of the higher yields of dry wood substance, given by the closer spacings, for pulp manufacture; and suggests that from this point of view the costs of closer spacing are not unduly high. Research on the optimum crop density for maximum yields of high-quality pulpwood, is greatly needed. Where labour is a critical factor, and on suitable sites, spacings could doubtless be increased somewhat. Dry pruning is considered to be of little value, and green pruning dangerous owing to the risk of decay.

[1019]. 23.24.3 : 12.25 (481) : 57 : 33.32 : 76. Børset, O. Valg av planteavstand. **[Choice of plantation spacing.]** *Tidsskr. Skogbr.* 55 (12), 1947 (315–32). 25 refs. [Nor.] Reply by G. G. Klem in *Tidsskr. Skogbr.* 56 (3/4), 1948 (85–7). [Nor.]

Reviews—mainly on the basis of relevant Scandinavian literature—the advantages of close and wide spacing. Contests Klem's conclusions on the relatively small effects of wide spacing on yield and stem form [see preceding abstract and *For. Abstr.* 9 (No. 2184)] but agrees that for economic reasons (and especially in view of labour difficulties) spacings should be increased in most cases. A spacing of 2 m. should be applicable on a large scale and in special cases one of 2·5–3 m. might be justified. A reply by Klem points out that in a second article [see next abstract] he has corrected the Fossum Verk figures for age and finds a rather more marked decrease in total yield at the wider spacings. He exposes certain apparent misinterpretations in Børset's argument and holds to his opinion that, pending the results of further trials now in progress, a cautious increase of spacings to 1·6, 1·7, or on suitable sites to 2 m., is as much as can be recommended.

[1020]. 23.24.3 : 12.25 (481) : 57 : 33.32 : 76 : 23.3. Klem, G. G. Våre kulturplaner og tiden. **[Time and Norwegian afforestation plans.]** *Tidsskr. Skogbr.* 55 (10 11), 1947 (298–300). [Nor.] Comments by M. S. Clason in *Tidsskr. Skogbr.* 56 (1 2), 1948 (29). [Nor.]

In connexion with the Vestland Forest Research Station's plan to afforest about 3 million dekares in western Norway over a period of 150 years, using 500 plants per dekare, Klem suggests the possibility that by increasing the spacing from 1·4 to 2 m., the programme might be carried out in half the time. Corrected figures for the Fossum Verk Norway Spruce trial [see preceding abstract and *For. Abstr.* 9 (No. 2184)] show that an increase of the spacing from 1·5 to 2 m. caused a drop of 7% by volume, or 12% by dry weight, in the total yield. Effects on pulp and timber quality were not serious. On the whole, the disadvantages of wide spacing would be small compared with the gain by establishing forest on such scale in 75 years, which would mean earlier timber production and savings in money, plants and labour.

Clason, commenting on both of Klem's articles, points out that halving the number of plants per unit area does not halve the labour involved in planting and increases the need for beating up. He suggests that much improvement could be attained by better organization of planting work, training of workers in rationalized methods, and payment by piece rates.

23.26. Plant Rearing. Nursery Practice

See also *For. Abstr.* 10 (Nos. 977, 1005, 1382).

[1021]. 23.26 : 23.23 : 12.26–8. Teng, S. C., and Yu, C. H. **Propagation of Weeping Willow from seed.** *Bot. Bull. Acad. Sinica* 2 (2), 1948 (131–2). 4 refs.

Seeds of *Salix babylonica* will retain their viability for 10 days if collected as soon as they fall and enclosed (with the white hairs intact) in a dark, tight container. On the ground, viability is quickly lost. When being sown, the seeds should be spread on moist seedbeds and watered thoroughly. Both sowing and germination are facilitated if the hairs are rubbed off the seeds with fine sand. The seedlings being very sensitive to drought, the seedbed is best covered with burlap or straw until germination and thereafter should be kept constantly moist by watering or shading; the shade should be removed when true leaves begin to appear (about 1 month after sowing), because the seedlings require an abundance of light.

[1022]. 23.26 : 23.23.3 : 45.12 : 34.6. HEMMING, E. S. **Sawdust mulch in seed germination.** *Amer. Nurserym.* 87 (11), 1948 (38).

A method of sowing nuts and acorns where rodent infestation is heavy. Sowing is done in the autumn in a shallow trench not more than 2 in. deep and 1 ft. wide. A liberal application of fertilizer is worked into the bottom of the trench and the seeds are then put in about 4 in. apart, i.e. in 3 rows. This spacing allows the seedlings to make whips, and is particularly suitable for fast growing species. The trench is then filled to the surface with sawdust and over this the soil is mounded to a depth of 4–6 in. Mounding prevents frost heaving, keeps the sawdust from blowing away, and hinders animals or birds from getting at the seed. In the spring when the seeds are about to germinate, the mound of soil is raked off, and the exposed sawdust provides an easy surface for the shoots to push through, while at the same time discouraging weed growth.

[1023]. 23.26 : 12.25 : 23.23.3. STEFANSSON, E. Försök med olika såddtäthet i plantskola. **[Experiments with different nursery sowing densities.]** *Skogen* 35 (11), 1948 (132–3). [Sw.]

Since 1946 the Sundmo branch station of the Swedish Forest Tree Breeding Association has been investigating the effects of sowing methods and related factors on plant yields of Scots Pine in nurseries. The present paper deals only with the effect of density of sowing. Stress is laid on the dependence of this factor on soil, breadth of seed drill, etc., and a warning is issued against direct application of the results to other nurseries. Seed was sown in early June, 1946, at densities from 100 to 400 seeds per metre of seed drill 2·5 cm. wide. In September, 1947, the plants of every second row were lifted and their green weight determined. Statistically significant correlations were found between density of sowing and weight of plants, e.g. plants from sowings at 100 seeds/m. were almost 2, 3, and 4 times as heavy as those sown at respectively 2, 3, and 4 times that density.

The plants were also graded for quality as good, average and poor. The yield of plantable stock (good and average quality) decreased steadily from 108,250 plants per kg. seed for the sowings at 100 seeds/m. to 61,100 for that at 400 seeds/m., the distribution of the individual quality groups showing a similar trend.

The greater weight at the lower sowing densities appeared to depend less on length of stem than on the number and size of the needles and development of the root system. To raise high-quality Scots Pine plants with the greatest economy in seed and at the minimum price (i.e. without transplanting), seed should be sown at the lowest density permissible under the local conditions. What effect these conditions have, must be determined for any given nursery. Results are tabulated.

[1024]. 23.26 : 23.24.1 : 12.25. HEDEMANN-GADE, E. Böra plantrötter beskäras? **[Should plants be root-pruned?]** *Skogen* 35 (5 6), 1948 (73). [Sw.]

It is difficult to dispense with root pruning of 2/2 Norway Spruce planting stock since (1) some damage to the root system during lifting is unavoidable even in light soils and with careful treatment, and (2) unpruned roots are apt to double up in the planting hole. In both cases growth is retarded. It is uncertain to what extent pruning favours fungus attack, and research on this question is much needed. The author has made limited trials in which $\frac{1}{4}$, $\frac{1}{2}$ or $\frac{3}{4}$ of the root system of Norway Spruce stock was removed either at transplanting or at the time of planting out. Growth, at least that of the succeeding season, was in general remarkably little affected, even by hard root pruning, and only in the plants that had lost $\frac{3}{4}$ of their roots was any check generally noticeable. In practice it is seldom that more than 20% of the root system would be removed and, disregarding the question of fungus attack, this should have scarcely any effect on growth—certainly less effect than that of crowbar planting of large stock or of roots doubled up in the planting hole. The best practice is possibly to root-prune fairly severely when transplanting, at 2 years of age. Such plants run little risk of root-rot in the nursery and, when lifted at 4 years of age, are suitable for planting out without further pruning.

[1025]. 23.26 : 23.24.1. HEDEMANN-GADE, E. Torr- eller våtinpackning av skogsplantor? **[Dry or wet packing of planting stock?]** *Skogen* 35 (8), 1948 (93). 1 ref. [Sw.]

Brief reference is made to a Danish method of packing, used with success in Norway, in which the plants are not wetted before packing but stored indoors round an ice container, without allowing the roots to come into contact with the

ice. For distribution the plants are put root to root, and care is taken to prevent the foliage becoming wet. Outside the roots is laid a thin cover of slightly moistened moss. The bundle is strengthened with laths, which permits air to circulate, and the whole is covered with heather or straw and wired in a packing machine. The method is said to prevent 'burning' [due to fermentation?], though this can be avoided even with 'wet' packing if air circulation is adequately provided for. A small-scale trial of the dry method, made at three nurseries in the county of Stockholm, using Scots Pine, Norway Spruce and Birch plants, gave inconclusive results, and it is urged that further tests should be made in Sweden before adopting the 'dry' method.

[1026]. 23.26.1 (768). **TVA produces trees [a short account of the Tennessee Valley Authority's nurseries].** *Sth. Lumberm.* 76 (2212), 1948 (40–1).

[1027]. 23.26.3 : 07.7 : 82. STEFANSSON, E. Omskolning av plantor med bräde: en arbetsstudie. **[Transplanting with boards: a work study.]** *Svensk PappTidn.* 51 (7), 1948 (167–71). [Sw.] (*Medd. Fören. Växtförädl. Skogsträd* No. 49.)

A time study was made of work with 4 types of transplanting board, all 1 m. long and holding 19 plants at 5-cm. spacing, but differing in the methods of holding the plants: (*a*) an ordinary board with parallel-sided saw-cuts for the plants; (*b*) one with V-shaped clips made of piano wire; (*c*) one with clips of flat spring steel; and (*d*) a special type having wide V-shaped saw-cuts along the base of which runs a lath, fixed to the board, the plants being firmly engaged between this and a second, free, cloth-covered lath which is held in position with the thumb while the fingers grip the board through a loop handle. With type (*d*) a special filling bench is used. This holds the board on edge, with the plant notches upwards, in a position such that the bottoms of the notches lie flush with a shelf supporting the roots of the plants while filling proceeds. All 4 types of board and the special bench are illustrated.

The timings, which covered the two most important phases of the transplanting job, viz. filling the board, and the actual planting operation, are tabulated and statistically analysed. They show that type (*d*) was clearly more efficient than the remaining types, of which (*a*) and (*b*) were roughly equivalent and (*c*) the least efficient. For the two timed operations together, (*d*) gained about 10 seconds per board as compared with (*a*) and (*b*), and 8 seconds of this represented savings in time required to fill the board.

[1028]. 23.26.3 : 42.23 : 12.25. HEDEMANN-GADE, E. Planträtternas känslighet för solbelysning. **[Sensitivity of roots of nursery plants to insolation.]** *Skogen* 35 (9), 1948 (110). [Sw.]

For many years use has been made in the nurseries of the Stockholm County Forestry Board of a simple screen made of a frame covered with sacking (more recently, with a masonite panel) to give shade and shelter to nursery stock waiting in boards for transplanting. This device can be shifted along the beds as transplanting proceeds. The author has made experiments to study the effects on lifted plants of exposure to strong sunlight for periods of up to 1 hour, using 1/0 and 2/0 stock of Norway Spruce and 1/0 stock of Scots Pine. The results, which are tabulated, show that no plants were materially affected by such exposure for periods up to 15 mins. An exposure of 30 mins. had practically no effect on the 2/0 Spruce and 1/0 Pine plants, but caused 50–65% mortality in 1/0 Spruce. Exposure for longer than 30 mins. was deleterious in all cases. As, in practice, plants are kept in the transplanting board for a few minutes only, the screen described is unnecessary so far as shade is concerned. It is nevertheless convenient as a means of holding the boards awaiting transplanting and is believed to be valuable as protection against wind.

[1029]. 23.26.4 : 12.25 : 11.47.13 : 12.11.23. WILDE, S. A., and VOIGT, G. K. **Specific gravity of the wood of Jack Pine seedlings raised under different levels of soil fertility.** *J. For.* 46 (7), 1948 (521–3).

The specific gravity of stem tissue was determined in 2-year-old Jack Pine seedlings grown under two widely different levels of soil fertility. The volume of stem sections was determined by the use of the Brail mercury volumeter, and their weight on an analytical balance after drying for 1 hour at 105° C. Seedlings obtained from natural reproduction on cut-over, coarse, sandy soil showed considerably higher specific gravity of wood than seedlings produced on heavily fertilized nursery beds [0·41 and 0·23, respectively, for average

stems]. The relation of the specific gravity of seedlings to their resistance against drought, sun-scorch, frost, winter injury, snow-press, sleet and parasites, is pointed out. The determination of specific gravity is suggested as a means of the evaluation of nursery stock. *Authors' summary.*

[1030]. 23.26.4 : 45.3 : 12.25. **[Use of arsenate of lead in seedbeds.]** *Rep. Qd. For. Serv. 1946–7*, 1947 (6).

The use of arsenate of lead in seedbeds, to control whitegrub damage to Hoop Pine, has passed the experimental stage. Stock from treated beds had a relatively high As_2O_3 content and remained unpalatable to the white grub when transplanted.

23.27. Arboriculture

See also *For. Abstr.* 10 (Nos. 906, 953).

[1031]. 23.27 (774). THORNTON, C. E., and FENNER, C. G. **Misplaced trees—or sidewalks?** *Trees, Cleveland (Ohio)* 8 (4), 1948 (9).

Account of the routine measures of inspection and the root-pruning, felling, etc., as may be necessary, taken by the public authorities at Lansing, Mich. to prevent damage to pavements by trees.

23.3. *Afforestation*

See also *For. Abstr.* 10 (Nos. 857, 890, 1012, 1020).

[1032]. 23.3 (411–4) : 91.5. **Britain's forests: Forest of Ae.** H.M. Forestry Commission, London. 1948. pp. 12.

[1033]. 23.3 (44) : 11.62.1. FENLEY, J. M. **Sand dune control in Les Landes, France.** *J. For.* 46 (7), 1948 (514–20).

[1034]. 23.3 (45). MERENDI, A. Come si rimboschisce. **[How to carry out afforestation.]** Ramo editoriale degli agricoltori S.A., Rome. 1940. pp. 69. [It.]

[1035]. 23.3 (491) : 21.0. FLENSBORG, C. E. Plantningsforsøgene paa Færøerne. **[Experiments in afforestation on the Faroes.]** *Repr.* from *Hedeselskabets Tidsskrift* 68 (5/6), 1947. pp. 12. [Dan.]

A historical survey of experiments since 1884. The experience of the last 40 years show that although the Faroese climate is not favourable to tree growth, *Pinus contorta*, *P. montana* and *Picea sitchensis* are particularly suited to conditions there. The author recommends the establishment of more small plantations and nurseries of these and other species in the islands.

[1036]. 23.3 (54) : 21.0. **Afforestation and regeneration of dry and desert areas with an annual rainfall of below 30 in.** *Proc. 6th silv. Conf., Dehra Dun 1945*, 1947 (107–35).

Thirteen papers [cf. *For. Abstr.* 7 (Nos. 203, 1776); 8 (Nos. 257, 888, 1056)] and report on a tour in the Punjab.

[1037]. 23.3 (549) : 11.62.11. KHAN, S. **Afforestation on the Kankura hills of Aurangabad forest division.** *Indian For.* 73 (12), 1947 (535–6).

Failures in the contour trenching and sowing of eroded slopes were in some degree offset by advantages resulting from proper fire protection and strict closure to grazing.

[1038]. 23.3 (569) : 23.21 : 27. PHILIPPIS, A. DE. **Notes and comments on afforestation in Palestine.** *Forest, Jerusalem* No. 1, 1947 (1–4). [Heb.]

The principal obstacles to afforestation in Palestine are the advanced state of degradation of the soil and natural vegetation, and the eastern-Mediterranean climate, which is unfavourable to forest growth. Only in the Mediterranean zone of the country are natural woodlands to be found—mainly of *Quercus ithaburensis Q. calliprinos* and occasional *Pinus halepensis* dominating a maquis-type scrub of *Pistacia*, *Ceratonia siliqua*, *Arbutus*, *Styrax* and other shrubs. Methods of improving these woodlands are recommended: (1) Making clearings of at least 100 sq.m. and planting these and natural openings with groups of *Pinus halepensis*, *P. pinea* and *Cupressus sempervirens*. The groups can be gradually extended. (2) Grafting and planting of *C. siliqua* and *Pistacia terebinthus* on sites where these species are abundant, in order to obtain pure stands. (3) Transformation into pure Oak coppice. This is recommended for woodlands rich in Oak and near colonies which can utilize the tanstuffs produced (acorn-cups of *Q. ithaburensis* as well as bark of both species).

Afforestation can be carried out only in the Mediterranean zone. Excepting the coastal

plain and the Emek, the whole of this zone is mountainous and rocky, and the soil often very shallow and predominantly of a *terra rossa* type. The clay and lime content of the soil is very variable, and this must be taken into account in choice of species. The extreme degradation of the soil will often lead to poor results at first and more than one rotation may well be necessary to restore its fertility. Terracing is advisable on slopes. Notes are given on the means of establishing *Pinus halepensis*, *P.h.* var. *brutia*, *P. pinea*, *Cupressus sempervirens* and other species. The indigenous *P. halepensis* is the most important single species. Direct sowing has so far failed [cf. *For. Abstr.* 10 (No. 1002)], but ball planting gives survival of 60–70% and sometimes even 80–90%. Planting must be done immediately after the first autumn rains; spacing may be as wide as 2 × 2 m. on good soils, but a closer spacing (1·0 × 1·0 m.) is advisable on poor or rocky soils so as to obtain closed canopy by the end of 3 years when cultivation ceases. Closer spacing also reduces branching and, consequently, pruning. It is also most desirable that care should be taken to identify and preserve the most valuable races. *P. halepensis* var. *brutia* has a better form and is more resistant to *Matsucoccus* attack, though it grows more slowly than *P. halepensis*. *P. pinea* can be established by direct sowing and will grow on clay soils unsuitable for *P. halepensis*. It has, however, a slower rate of growth and cannot endure calcareous soils. Eucalypts (mainly *E. rostrata*) have been much planted, but often with rather disappointing results, a rapid initial growth rate being succeeded by a period of check. Where rainfall is less than 500–600 mm. irrigation is necessary.

[1039]. 23.3 : 12.26–8 (569) : 11.62.11 : 11.48.5 : 11.49.2 : 12.11.22 : 23.24 : 23.25. MAYTES, Z. **The Tamarisk in the Negev.** *Forest, Palestine* No. 1, 1947 (23–7). [Heb.]

The author lists and describes 9 species of *Tamarix* found in Palestine, 8 being indigenous and one imported about 20 years ago, and stresses their particular importance for the Negev, where they are the chief tree planted by the Jewish National Fund. Tamarisks also occur naturally in the Jericho plain and along the coast, where the government has used them during the past 25 years for fixing dunes. They are very adaptable to the peculiar conditions of soil, climate and water level, and the great temperature changes characteristic of desert regions, being found on the shore of Caesarea (annual rainfall 5–600 mm.), at Asluj (80–100 mm.) and by the Dead Sea (30–50 mm.), even on salty soil. They are therefore suitable for many purposes, from stabilizing coastal and inland dunes to afforesting salty ground (e.g. the banks of the Jordan north of the Dead Sea), loess formations and eroded land. They should also play an indispensable role in shelterbelts and avenues for the new agricultural settlements in the Negev.

Propagation, which is by shoot cuttings, has not proved too easy and more research is needed into such factors as times of planting, the preparation of cuttings and the species best adapted to different sites. Cuttings are made from branches a year or more old; the Arabs prefer green branches, sometimes with their side twigs, but for planting *in situ*, woody branches of over 1 cm. in diameter are more suitable. Length varies from 25–30 cm. for nursery stock to 40–50 cm. in heavy soil and 60–80 cm. in shifting sand. If they cannot be planted at once, they may be kept for 2–3 weeks buried in clean sand; but prompt planting from local tree or nursery cuttings is best. Dug holes are unnecessary; the cuttings can be dibbled in, the 5–10 cm. left above ground being well earthed against desiccation. Planting should be done when the soil has become damp to a depth of 40–50 cm. and at the same time warm, i.e. not before February in sandy soils or March in heavy soils. As the Tamarisk begins to bud early in April, the work of planting requires careful timing and organization.

Choice of species. In shifting dunes, the 'dune' Tamarisk [*Tamarix pseudo-pallasi*?] succeeds best, reaching 2 m. in height, with 10–12 side shoots, in one year: in light soils, the 'jointed' Tamarisk [*T. articulata*?], which is also considered the best species for avenues and windbreaks: in salty soils, the Dead Sea Tamarisk [*T. maris-mortis*] and 'square' Tamarisk [*T. tetrandra*?]: in damp soils, e.g. along wadis with springs, the Jordan Tamarisk [*T. jordanis*]. These (indigenous) species, with *T. mannifera*, were introduced experimentally to the Negev region in 1945–46 and results are awaited.

[1040]. 23.3 (569) : 11.62.11 : 23.24 : 12.26–8. SALE, G. N. **Note on sand dune**

fixation in Palestine. *Emp. For. Rev.* 27 (1), 1948 (60–1 + 4 photos).

Describes the method of growing *Acacia cyanophylla* seedlings in pots and planting them out in bare sand in pits 3 ft. deep with only the top twigs emerging from the sand [cf. *For. Abstr.* 10 (No. 235)]. A method of harvesting the crops of *Acacia* firewood has been developed with experience. The trees are uprooted in winter, leaving a hollow in the sand, which soon becomes ringed by numerous root shoots which develop vigorously. The resulting circle of young trees together with odd root suckers and seedlings, considerably increase the density of stocking in the second rotation.

[1041]. 23.3 (711.1 : 712.1) : 60.31.2 : 24.4. EDWARDS, C. A. **Tree planting and forestry practices in the prairie areas of Western Canada.** *For. Chron.* 24 (2), 1948 (111–16).

Includes notes on the principal species used for woodlot and shelterbelt planting in the Prairie Provinces.

[1042]. 23.3 (748). **Revegetation of spoil piles from bituminous coal strip mining.** *For. Leaves* 38 (2), 1948 (12–4).

Practical recommendations prepared by the Pennsylvania Agricultural Extension Service, for planting spoil mounds resulting from open-cast coal mining.

[1043]. 23.3 (77). **Spoil banks reclamation.** *Rep. Cent. St. For. Exp. Sta. 1947* [1948] (3–5).

Reports on (1) a reconnaissance to determine the extent of strip-mined areas in the Central States region and their suitability for planting; (2) planting tests to determine the suitability of strip-mined lands for afforestation; (3) development of a system of classification of strip-mined land as a guide to forest planting Tests of the effects of levelling spoil banks on tree growth indicate slower growth on levelled than on unlevelled banks composed chiefly of clay, whereas in lighter-textured soils survival and growth seem to be as good on one as on the other [cf. *For. Abstr.* 9 (No. 247)]. Tests of direct sowing on spoil banks show some promise of success for heavy-seeded species such as Oaks and Walnuts; sowings of conifer seeds were largely destroyed by erosion. A site classification has been prepared, based on acidity, texture and proportion of soil in the spoils material, together with topography and stability of the banks, character and density of existing vegetation and character of the material forming the overburden.

[1044]. 23.3 (772). DENUYL, D. **Reforestation of spoil banks.** *Abstr.* in *Proc. Indiana Acad. Sci. 1946*, 56, 1947 (173). A.P.B.

In 20 years 12,000 acres of spoil bank in the stripped coal lands of Indiana have been planted with 30 species of forest trees. *Robinia pseudoacacia* is the main hardwood planted and *Pinus resinosa*, *P. strobus* and *P. banksiana* are the most commonly planted conifers.

[1045]. 23.3 (772) : 11.62.11 : 12.25 : 12.19.4. POTZGER, J. E., and POTZGER, E. W. **Progress in succession in the Pennington [Indiana] grove of *Pinus virginiana*.** *Repr.* from *Butler Univ. bot. Stud.* 8, 1948 (153–60).

Reports a study of succession in a stand of pure *Pinus virginiana* on eroded, worn-out soil over a period of 15 years. In 1932, broad-leaved species were absent even from the ground layer. By 1947 it was clear that the Pine was not reproducing itself and that it would ultimately be replaced by mixed hardwoods, which were already abundant. Apparently it required 60 years to build up the better soil conditions, especially water-holding capacity, which enable hardwoods to establish themselves. It is suggested that *P. virginiana* would be a suitable species to protect and improve worn-out and eroded soils in Indiana.

[1046]. 23.3 (773) : 11.48.3 : 12.25 : 21.3 : 23.24.3. MINCKLER, L. S. **Planted Pines on claypan soils in southern Illinois.** *Sta. Notes Cent. St. For. Exp. Sta.* No. 44, 1948. pp. [2].

Describes the progress of Pine plantations [*Pinus echinata*, *P. taeda*, *P. rigida* and *P. virginiana*] on claypan soils in southern Illinois. Eight years after planting more than 85% have survived. Shortleaf [*P. echinata*] appears to be the most successful and will produce suitable mining timber. It grows less quickly than Loblolly [*P. taeda*], but the latter is subject to snow and ice damage. Spacing of 6 × 7, 7 × 7 or 6 × 8 ft. is recommended in planting.

[1047]. 23.3 (773) : 11.48.3 : 12.26–8 : 21.3. MINCKLER, L. S. **Planted Black Locust on claypan soils of southern Illinois.** *Sta.*

Notes Cent. St. For. Exp. Sta. No. 46, 1948 pp. [2]. 1 ref.

Gives reasons for the failure of Black Locust (*Robinia pseudoacacia*) on highly acid claypan soil in Illinois, where a thin layer of strongly leached topsoil rests on an almost impervious subsoil of light grey clay. The Black Locust, which needs a deep, well aerated and drained soil, is being cleared at a dead loss to make way for Pine plantations.

23.5. *Underplanting. Nurses. Filling Gaps*

See also *For. Abstr.* 10 (Nos. 996, 1012).

[1048]. 23.52 : 12.26–8 (675). Expérience sur les essences d'ombrage. **[Experiment with shade-tree species.]** *Rapp. Inst. nat. Étude agron. Congo Belge 1944–5*, 1947 (48–9). [F.]

A number of species were planted in 1935 to test their suitability as shade-trees for Coffee plantations. *Albizzia moluccana* and *Erythrina lithosperma* give very effective shade. *Inga saman* and *Tetrapleura tetraptera* are equally good, but of slow growth; *I. saman* is too short-lived. *Rauwolfia vomitoria, Maesopsis eminii* and *Dichrostachys puberulata* are all satisfactory.

24. TENDING OF STANDS AND TREES

See also *For. Abstr.* 10
(Nos. 922, 981, 983, 1248, 1501).

24.2. *Thinnings*

[1049]. 24.2 : 65.7 : 11.44 : 11.47.2 : 56 : 57: 74 : 12.25. ANDERSSON, E. Gallringsteknik och skogsekonomi. **[Thinning technique and forest economics.]** *Norrlands Skogsv-Förb. Tidskr.* 1942 (2), (209–327). [Sw.sw.]

Andersson discusses in general terms the factors affecting the increment of Scots Pine and Norway Spruce stands and attributes the progressive decline of volume increment from 40–50 years of age onwards largely to inactivation of the humus layer and the locking up of nutrients therein as a consequence of increasing stand density and shade. Unless the humus is 'resistant' (Hesselman's terminology), its decomposition will be stimulated, and nutrients again made available, by suitable thinning. Research on humus conditions has suggested that stands of medium density ought to give the best yields and the main object of the author is to determine what density can be considered the optimum.

Besides density, the $h\,d$ (mean height/mean diameter) ratio also appears from the author's own investigations to have an important effect, as he has found that for trees of uniform age and the same quality class, the increment % is approximately inversely proportional to the square root of diameter, independent of age.

Using Schwappach's German and Maass' Swedish yield tables together with figures from personal investigations in Gästrikland, Andersson arives, by extrapolation from graphs of these data, at values for the maximum mean height (H_o) and the maximum volume per ha. of mature stands (K_o) for each species and quality class. Maximum volume per ha. at any stage of development (K_o) is found to be expressed by the term K_oE, where E (reflecting the stage of development is

$$\sqrt{\frac{h}{H_o}\cdot\frac{h}{d}}$$

for Scots Pine, and

$$\sqrt{\frac{h}{H_o}\cdot\sqrt{\frac{h}{d}}}$$

for Norway Spruce. Relative crop density at any stage (O.S) is now expressed by $\frac{k}{K_o}$, where k = actual volume per ha.

First attempts to relate crop density to increment gave rather poor correlation, but by multiplying the increment % by

$$\sqrt{\frac{d}{H_o}}$$

a product (P_o) was obtained which represents increment capacity freed from the influence of diameter. The P_o values obtained from all yield-table sources satisfied, with fairly high accuracy, the straight-line relationship $P_o = 6\,(1 - \text{O}.S)$, and this in spite of the differences in climate, provenance, tending, etc., represented by the material, though it is admitted that dispersion of the values would have been greater if the data had not already been smoothed in the construction of the yield tables. Further derivations from this formula, giving a measure of increment at any crop

density and for any quality class and h/d ratio, are:

Scots Pine: I (Increment) $= 0{\cdot}S \cdot K_o \cdot P_o \cdot \frac{h}{d}$;

Norway Spruce: $I = 0{\cdot}S \cdot K_o \cdot P_o \sqrt{\frac{h}{d}} \sqrt{\frac{h}{d}}$.

An increment table based on these formulae is presented. It is intended mainly as an aid to silviculture but will also give provisional determinations of increment. On the other hand, it does not replace yield tables but indicates increment for different degrees of density at given stages of development of a number of quality classes.

In order to provide a ready index to relative crop density, values are included in the table for breadth of the last 5 annual rings in % of the b.h. radius under bark. For stands (*not* for open-grown trees) this ratio is closely correlated with crop density and is independent of quality class and age class.

The most striking result of the analysis was that for all quality classes increment is greatest at a relative crop density of 0·5 (about the density of 60-year-old stands subjected to normal thinnings). The lower increments on both sides of this optimum have probably confused the interpretation of thinning results in the past. The influences of increasing density and falling h/d ratio appear to be of about the same order of magnitude. Both of these factors can be regulated—the former by varying the heaviness of the thinning and the latter, within limits, by varying the form of thinning, i.e. by thinning from above or from below.

Up to 40–50 years of age, thinnings remove chiefly the undesirable trees but generally have little or no effect on total increment. Relative crop density can be allowed to rise to 0·60 before it need be regulated by thinning. After 50 years of age, as increment falls away with increasing density, the optimum density of 0·50 should be restored periodically by thinning, and so far as possible, efforts should be made to keep a high h/d ratio—preferably above 0·75 (h in m., d in cm.).

The remainder of the paper is devoted to implications of these conclusions (*A*) in the tending of stands, (*B*) in relations between forestry and industry, and (*C*) in relation to the economic success of forestry.

(*A*) A hypothetical case of thinning from above versus thinning from below is considered and it is urged that the former method is better adapted to the needs of the times and deserving of trial. It produces larger intermediate, smaller final, but larger total volume yields from a smaller growing stock (average for rotation), gives much more scope for selection, facilitates the removal of trees with a low h/d ratio (not only the poorest yielders but also usually the branchiest), and in general makes for a final yield of high timber quality and value.

For the practical regulation of crop density it is necessary to have a practical measure of spacing for use in thinning operations. Andersson recommends using a so-called *minimum spacing* which is adjusted to the sizes of adjacent stems in such a way as to result in a desired mean spacing over the stand. By trial it was found that to lay down a minimum spacing of 60% of the desired mean spacing gave the result required. This has the advantage of giving a uniform spacing rule for all age classes of a given quality class and requires only easily made corrections for the individual quality classes. Such a rule would be used only to check spacing in doubtful cases, once the thinning gangs had grasped the method. The general formula (the derivation of which is given in detail) for the minimum space between two stems of d.b.h. respectively d_1 and d_2 in. is; Minimum spacing $= X(d_1 + d_2 - C)$ decimeters, where X is a so-called spacing factor and C is a constant depending on quality class. Values are tabulated.

Thinning should not be necessary oftener than every 7th year if the relative crop density is between 0·50 and 0·60, and not even then, provided that the ring-breadth ratio (see above) is satisfactory (at least 1·7% for Scots Pine and 1·9% for Norway Spruce). Caution will clearly be necessary in dealing with previously underthinned stands.

In the lowest quality classes, where timber yield and quality are poor, it might be possible to practise 'crown selection fellings' with advantage. Under the system envisaged, trees of only 5–6 in. d.b.h. would be produced for pulpwood, and from about 50 years of age onwards such trees would be removed in successive fellings, relative crop density being maintained at 0·50. It would be necessary to reserve some seedbearers of good quality, say 50 per ha., for natural regeneration.

For the better sites it is envisaged that regeneration would take place under comparatively dense shelterwood (about 300 trees per ha.) which would be removed in three fellings at intervals of 7–10 years and should be of high quality and value.

A comparison is also included of Scots Pine and Norway Spruce in pure stands and in mixture with each other, from which it is concluded that these species are not mutually complementary and are better grown separately.

(*B*) An attempt is made in this section to show that the treatments suggested will adequately cover the needs of present-day industries by providing (*a*) timber in somewhat smaller quantity but much higher quality, and (*b*) suitable pulpwood in far greater quantity, than in the past.

(*C*) Theoretical calculations are made, from the data obtained from manipulation of the yield-table figures, to compare the economic effects of treating two exactly similar stands by (*a*) a crown thinning, and (*b*) a low thinning, both made 25 years before the final felling, assuming certain effects on quality and value. These show that the total revenue may be 24% greater for the crown thinning and that the initial capital value of soil and regeneration (4% compound interest being charged in the case of both treatments) may be Kr. 51 per ha. with the crown thinning and Kr. 33 per ha. with the low thinning. The theoretical advantage of the former is more clearly brought out if these initial values are capitalized at the stated interest for 60 years, when the values of soil and growing stock together then amount, for the two treatments respectively, to Kr. 542 and Kr. 348 per ha., much higher values than similar sites and stands had 60 years ago.

[1050]. 24.2 : 12.25 : 57 : 76. MØLLER, C. M., and HOLMSGAARD, E. Stærk Hugst, svag Hugst og Hugst fra Toppen: et Forsøg i Rødgran. **[Danish crown thinning, thinning from below, and selection thinning from above: an experiment with Norway Spruce.]** *Dansk Skovforen. Tidsskr.* 32 (12), 1947 (393–445). 25 refs. [Dan.e.]

From 1930 onwards the following treatments were applied to plots (3 for each variant) in a then 27-year-old pure stand: (1) Light thinning from below, on a cycle of about 3–4 years. (2) 'Frijsenborg thinning', i.e. a heavy Danish thinning, on a cycle of about 2 years, in which trees are removed from above and below to favour the best formed trees, whether or not these are dominant, and to keep their crowns free. (3) 'Selection thinning' (from above), on a cycle of about 2 years, which was carried out in such a manner that the mean diameter of the fellings exceeded that of the residual stand.

Results to 1945 are analysed. They show that: (*a*) Selection thinning reduced height and diameter as compared with those under the other treatments, the selectively thinned stands having a height (in 1945) corresponding to that of a normal stand 5 years younger. (*b*) The selection thinnings left the most and the Frijsenborg thinnings the fewest trees standing at the end of the period. (*c*) The 3 treatments caused no statistically significant differences in volume increment or form factor. (*d*) The volume removed in thinnings and the mean diameter of the trees cut were greatest under selection thinning and least under the light thinning from below.

Financial calculations are made, using 3 price scales with varying prices for poles and laths (the actual prices for these being very variable), and it is shown that the financial returns for thinnings, whether carried forward at 4% compound interest or not, are greatest under selection thinning and least under the light thinning from below, on any of the price scales. Though the maximum absolute differences occur when high prices are assumed for laths and poles, the maximum percentage difference occurs when prices for these are low. The realization value of the residual stands in 1945 would have been greatest for the lightly thinned and least for the selectively thinned plots; but if the value of thinnings is added, the greatest value would have been given by the Frijsenborg-thinned stands.

It is not possible to ascertain the expectation value of the selectively thinned plots with certainty, but making the fairly probable assumption that it equals that of plots 5 years younger and subjected to Frijsenborg thinnings, the financial yield of these two methods would be roughly equal at 4% interest, though if a higher rate of interest is used the advantage goes to selection thinnings.

Selection thinning would be most advantageous when: (i) The crop includes many large and poorly formed trees. (ii) Small products are unsaleable or poorly paid. (iii) It is desired to secure large returns at an early age.

(iv) Medium-sized products fetch the best prices. (v) It is desirable to prolong the rotation and so reduce average planting expenses.

The paper includes a discussion of previous literature and of the physiological aspects of the experimental results, chiefly in relation to work by C. M. Møller. [See *For. Abstr.* 7 (No. 2096); 9 (No. 1337).]

[1051]. 24.2 : 12.25 : 21.63 : 32.1 : 56 : 46 : 12.25 : 32. TINNEY, W. A., and MAIMBERG, D. B. **Tree management and marking rules: second-growth Douglas-Fir.** *Forest Resources Series, Skagit Forest Council, Sedro Woolley, Washington* No. 2, 1948. pp. 33. [Univ. of Washington College of Forestry.]

In this study, special crown classifications and marking rules had to be developed for immature, even-aged stands of Douglas Fir. The dominant [D], co-dominant [CD], and intermediate [I] crown classes were broken down into the number of sides of the crown free from competition, as follows: D–2, D–3, D–4, CD–1, CD–2, CD–3, CD–4, I–0, I–1, I–2, I–3 and I–4. The samples indicated that thinnings increased the periodic diameter increment rate in all crown classes except I–0 and I–1. The marking rules provide for the removal of all D–4 trees and the freeing of the CD and I crown classes on one additional crown side. (Freeing of only one additional crown side reduces the danger of windthrow and sunscald.) It is claimed that these marking rules are easily learnt and permit latitude as to diameter, form, etc. in trees chosen for removal.

The second half of this study is devoted to the effects of thinnings on 10 one-acre plots, the data for which are presented in a series of tables. The following conclusions were reached. Within broad limits, growth after thinning is not necessarily correlated directly with percentage of basal area and volumes removed, but depends on the diameter-class distribution of the cut and the release of individual trees. Comparisons of periodic annual growth before and after thinning give negative results when made on an acre basis, but when comparison is made on a tree-for-tree basis, accelerated growth becomes apparent and the real results of thinning can be assessed. There is no indication that growth per cents are increased as a result of thinning, nor does it appear that thinning will disrupt the general upward trend of the mean annual cubic-foot and board-foot growth (Scribner rule) before the peak period.

An analysis of logging damage was made at the same time. Damage and scarring of the residual stand can be reduced to a minimum if the following general rules are observed:— (1) Fit the equipment to the size of the timber and general lay-out of the operation. (2) Avoid using a caterpillar larger than a D–4 off the main skidding tracks and keep the number of tracks to a minimum. (3) Fell trees at an angle to the track, limb them before skidding, and bring them out top end first. (4) A drum-and-line combination should be used with caution, the line should be taken direct to the tree (in a straight line) without winding round standing trees. (5) Other things being equal, scarring is much less in winter operations than when the sap is up.

[1052]. 24.2 : 12.25 (711) : 22.88.2 : 24.51. WARRACK, G. **Thinning and pruning of second-growth Douglas Fir in the coastal region of British Columbia.** *Res. Notes B.C. For. Serv.* No. 13, 1948. pp. 8.

[1053]. 24.2 : 12.25 : 24.51 : 56.02 : 07.7. STEPHENS, E. P., and SPURR, S. H. **The immediate response of Red Pine to thinning and pruning.** *Proc. Soc. Amer. For. 1947*, 1948 (353–69). 3 refs.

The immediate reactions of Red Pine to thinning and pruning in 20-year-old plantations in the Harvard Forest were measured by the dial gauge dendrometer [cf. *For. Abstr.* 8 (No. 2794)]. Growth was measured in terms of radial increment of the stem 3–4 ft. from the ground. In the thinning experiment, the trees released on June 2, 1947, increased their growth rate by 41% in 24 hours, and 35% by the end of the season. In the pruning experiment (made on the same day), the removal of 2 live whorls apparently had no detrimental effect on growth, but the removal of 3 live whorls decreased growth by 13% at the end of the season.

The size of the stem, expressed in terms of radius, fluctuated daily, varying directly with relative humidity and rainfall and inversely with air temperature [cf. *For. Abstr.* 9 (No. 1941)]. When dendrometer readings are taken at weekly intervals, the effects of these daily fluctuations are minimized and the weekly readings apparently give a valid measure of actual growth. The experiment showed the

need of determining the growth rate of individual trees before treatment.

[1054]. 24.2 : 22.88.2 : 12.26–8 (775) : 24.51. STOECKELER, J. H., and ARBOGAST, C. F. **Thinning and pruning in young second-growth hardwoods in Northeastern Wisconsin.** *Proc. Soc. Amer. For. 1947*, 1948 (328–46). 2 refs.

Presents 8 years of experimental data from sample plots in an 11-year-old northern hardwood stand. Thinning on a 'crop-tree' basis produced no acceleration in basal-area growth or in total volume of wood per acre, but caused a marked acceleration in the growth of crop trees, maximum response being made to thinning to a radius of 5 ft. round the base of crop trees. American Elm, Hard Maple, and Basswood showed the greatest, and White Ash the least percentage increase in volume. Curves are presented showing mortality and diameter increment for the various species under different conditions of thinning. Rate of healing of pruning scars varied greatly with species. White Ash healed most rapidly, followed by American Elm and Sugar Maple. Basswood was a poor fourth. Rate of healing varied also with the diameter of the limb at the time of pruning. Pruning should apparently be limited to limbs of less than 1 in. diameter in young stands. Cuts made on living limbs healed very much faster and with less incipient decay than dead limbs. Removal of wolf trees by girdling proved highly effective.

[1055]. 24.2 : 12.26–8 : 57 : 65.7. JAGD, T. Egens Stamtalsafvikling. **[Reduction of number of stems per ha. in Oak stands.]** *Dansk Skovforen. Tidsskr.* 33 (4), 1948 (166–72). [Dan.]

In the author's view, heavy thinning of Oak [*Quercus robur* s.l.] in youth is far less dangerous than light thinning, since it is difficult to get poor, crowded crowns to develop satisfactorily. When the aim is increment on the best stems, individual vigour, in a light-demanding species such as this, is incompatible with a high stand density. The following comparison is made of a fine, heavily thinned 62-year-old stand at Bjerge Eng with some others, corrected where necessary to the same age, but with no correction for the relatively small differences in quality class:—

	Stems/ ha.	*Diam.*	*Height*	*Basal area*
		(*cm.*)	(*m.*)	(*sq.m.*)
Bjerge Eng	**101**	**38·5**	**19**	**11·79**
Kongeskov	138	33·6	21·1	12·16
Bremerhus	155	34·3	20·6	14·41
Bregentved VI 57.	100	39·0	23·0	11·95
C. M. Møller's tables.	350	27	19	18·2

The ideal for a 120-year-old stand of quality-class 1–1·5 is suggested as: stems ha. 50, height 28–29 m., basal area 22 sq. m., clear bole 11–12 m., volume 300–350 cu.m.

The chief difficulty of heavy thinning is to secure continuity of treatment over the long rotation. Selection and marking of crop trees should not be done too early, and once marked, these trees must be the basis for future treatment of the stand.

[1056]. 24.21 : 12.25 : 56.02 : 07.7. SPURR, S. H. **Row thinning.** *Proc. Soc. Amer. For. 1947*, 1948 (370–7). 5 refs.

Experiments in line thinning of 3 plantations of White Spruce are described. It is concluded that line thinnings besides being cheaper, may be practically as efficient as selective thinnings in stimulating growth. The increment following thinnings of all types may be due as much to improved root and soil conditions as to greater crown space, and while line thinning is inferior to selective thinning in securing uniform crown expansion, it is at least as effective in improving root and soil relations. It has the additional advantage of rendering the stand accessible for subsequent selective thinnings. The measurements in this experiment were made with the dial gauge dendrometer [cf. *For. Abstr.* 8 (No. 2794)], whose working is discussed.

24.3. *Opening of the Canopy. Release and Improvement Fellings (including Poisoning and Girdling)*

See also *For. Abstr.* 10 (Nos. 992, 1157).

[1057]. 24.3 (569) : 27. ENGELCHUK, M. **Cultural improvements in the natural forest of Eylon.** *Forest, Jerusalem* No. 1, 1947 (21–2). [Heb.]

[1058]. 24.3 : 12.26–8. **Factors affecting the sprouting of Blackjack Oak.** *Rep. Cent. St. For. Exp. Sta. 1947*, [1948] (7–10).

It has been shown earlier that shallow-girdled trees of *Quercus marilandica* sprout less profusely than deep-girdled ones. A more detailed analysis of the data shows that the proportion of trees with live sprouts after 5 years is essentially the same for trees girdled to a depth of $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ in. into the sapwood. Decreasing the depth of girdle from $\frac{1}{4}$ in. to at least $\frac{1}{20}$ in. results in a progressive decrease in sprouting, the rate of decrease becoming greater at the shallower depths. It appears, therefore, that if girdling is to be effective in reducing sprouting, the girdle must not penetrate more than $\frac{1}{4}$ in. into the sapwood, and the shallower it is, the less will the sprouting be. If, on the other hand, the girdle is to be at least $\frac{1}{4}$ in. deep, the actual depth makes no material difference to subsequent sprouting.

The proportion of girdled trees that sprouted varied indirectly with the diameter of the tree. The proportion of trees with living sprouts 5 years after girdling is almost a straight-line relationship, decreasing from 83% for 1-in. trees to 0% for 13-in. and up. Sprout mortality was greater for the larger trees. The average crown area of girdled trees increased progressively with increase in tree diameter from about 6 sq. ft. for 1-in. trees to 500 sq. ft. for 14- and 15-in. trees. The diameter of the parent tree did not materially affect the crown area of the resulting sprout clump 5 years after girdling. The time required for girdling a tree increased with increase in diameter and ranged from about 2 minutes for 1- to 4-in. trees to about 7 minutes for 13- to 15-in. trees. A curve is constructed, combining all these relationships and showing the much greater benefits to be derived from girdling the larger trees. Girdling of 1- and 2-in. trees is of questionable value and priority should be given to the larger trees.

[1059]. 24.31 : 12.25 : 12.11.12. **[Poisoning of Hemlock with sodium arsenite.]** *Rep. Nth. Rocky Mt. For. Range Exp. Sta.* 1947 (7).

An experiment is being made in poisoning defective Hemlock with sodium arsenite. Initial results from poisoning in July are promising. It was observed that some branches often survived on a tree when all the others were killed, and that surviving branches were most common where crown competition was greatest. It is suggested that those parts of the tree where physiological activity is very low may not take up enough poison to cause killing.

[1060]. 24.31 : 12.26–8. **[Poisoning of *Ficus* trees.]** *Rep. silv. Res. Adm. Ceylon 1946*, 1948 (4).

Experiments in poisoning of giant *Ficus* trees were continued. A reduction in the dosage from 1 oz. to $\frac{1}{8}$ oz. of sodium arsenite per bore proved quite satisfactory, provided that the right points for inserting the poison were selected. Sixteen to 33 bores sufficed to deal with the largest and most complicated trees, some exceeding 20 ft. in girth.

[1061]. 24.31 : 82. Sims, I. H. **Most efficient crew for chopping and poisoning trees.** *Res. News Stheast. For. Exp. Sta.* No. 1, 1948 ([3]).

A crew of 2 men chopping and one man poisoning proved the most efficient in a study of 4 different crew organizations for poisoning trees by the 'cup' method [cf. *For. Abstr.* 9 (No. 2209)]. Their accomplishment per man hour was 107·8 cups on 36·3 trees of an average diameter of 8·0 in. Factors affecting accomplishment were amount of slash and brush to be removed, and walking time between trees. No effect of tree diameter was observed within the range treated (4·6–12 in.).

24.4. *Shelterbelts. Windbreaks*

See also *For. Abstr.* 10 (No. 1041).

[1062]. 24.4 : 06.6. Hawkes, C. L. **Methods of extending forestry.** *J. For.* 46 (6), 1948 (443–8). 15 refs.

Describes some of the methods evolved for interesting farmers in shelterbelt planting and indicates their relative effectiveness per dollar of cost.

[1063]. 24.4 (777) ? 11.49.5 : 21.0 : 23.6 : 42. [McComb, A. L.] **Survival and growth of trees and shrubs on peat and muck soils in Iowa.** *Rep. Ia. agric. Exp. Sta.* 1947 (227).

This project seeks to determine what species of trees and shrubs will survive and make satisfactory growth when planted for shelterbelts on muck and peat soils. The initial planting was made in 1945 and to date the most promising trees on peat are *Salix lucida*, *S. vitellina*,

Picea glauca, Pseudotsuga taxifolia, Fraxinus lanceolata and *Acer saccharinum*. Considerable difficulty has been experienced in getting satisfactory establishment at low cost, the principal obstacles being weeds, rabbits, and winter injury. The most satisfactory method of weeding appears to be mowing the weeds between rows periodically when they have attained a height of 12–16 in., and hand weeding round the trees. Mowing does not turn over new soil, and this fact, plus the mulching effect of the cut weeds, tends to reduce the abundance of the second weed crop. It has been found impossible to establish American and Chinese Elm on the peat lands because of rabbit damage. Most of the evergreens suffer winter injury; this can probably be minimized by planting several dense rows of corn, grass or soybeans to the north of woody plants and leaving them unharvested.

[1064]. 24.4 : 11.41.3. BATES, C. G. **Shelterbelts as 'conservers' of moisture.** *Tech. Notes Lake St. For. Exp. Sta.* No. 293, 1948. pp. 2.

Soil evaporation was directly measured by placing pots of soil of uniform texture and moisture at various distances north and south of east-west shelterbelts in Kansas and North Dakota, and exposed for 3–6 months. The data, presented and analysed in a table, indicate that reduced wind movement to the north of a shelterbelt, plus the cooling effect on an area deprived of sun heat, reduces evaporation at 1–5 *H* (*H* = one belt height). The smaller wind reduction to the south, plus reflected heat, produces increased evaporation at corresponding stations. The average evaporation from 10 *H* south to 10 *H* north was about 1% less than that at 15- and 20-*H* on both sides, and this difference may represent the effect of wind reduction alone.

[1065]. 24.4 : 12.26–8 (82) : 23.2 : 23.6. WILLIAMSON, J. Un forestal indígena, *Schinus polygamus*, recomendable para la formación de cercos vivos y reparos en regiones semiáridas. **[An indigenous species, *Schinus polygamus*, suitable for forming hedges and windbreaks in semi-arid regions.]** *Rev. argent. Agron.* 15 (2), 1948 (119–21). [Span.] E.M.B.

Schinus polygamus and its various subspecies or varieties (especially that locally known as 'Arenícola') proved the most suitable of several Argentine species for hedges and windbreaks since they grow rapidly, are resistant to drought, and are easy to propagate and transplant. In Argentina, sowings should be made between August 15 and September 15, and seedlings transplanted during the March April rainy season or at the end of August and during September. To encourage root formation the plants should be cut back, leaving only 5 cm. of stem. As *S. polygamus* has an extensive and deep root system it is unsuitable for hedging gardens and small plots of cultivated land.

24.5. *Pruning*

See also *For. Abstr.* 10 (Nos. 1052–4, 1466).

[1066]. 24.51 : 12.26–8 : 31.8. ROTH, E. R. **Healing and defects following Oak pruning.** *J. For.* 46 (7), 1948 (500–4).

A study of the effect of season of operation and size of pruning wounds on healing and decay was made in a second-growth stand of mixed Oaks [*Quercus alba, Q. coccinea, Q. velutina* and *Q. montana*] in Virginia. Exposed tissue round wounds made during the early growing season does not die back as much as tissue round wounds made at other seasons of the year, but there is greater danger of loosening the bark round the wounds. Width of wound is a better criterion for measurement of pruning wounds than an average of width and length, since width rather than length of a wound determines its healing time. Season of pruning has little or no effect on healing when bark stripping is kept to a minimum. Pruning of *Q. alba* is of doubtful value in open stands, since epicormics develop profusely on the boles of pruned trees. Wounds more than 1·5 in. wide may result in decay. The extension of both decay and discoloration was greater downwards than upwards. In pruning dead branches the cut should be made through the living callus at the base of the branch so as to promote rapid healing. Live-branch pruning on young, vigorous Oaks not above 5 in. d.b.h. will result in quick healing, prevent loose knots, and provide a maximum of clear length. *From author's summary.*

3. FOREST UTILIZATION. FOREST TECHNOLOGY

See also *For. Abstr.* 10 (Nos. 968–9).

[1067]. 3 : 01.2. CORKHILL, T. **A glossary of wood.** Nema Press, Ltd., London. 1948. pp. 656. Price 21*s*.

A comprehensive illustrated glossary with definitions of terms used in lumbering, marketing, woodworking, building, architecture and a variety of miscellaneous subjects; also the commercial names of different timbers and abbreviations in common use.

[1068]. 3 : 09.7. RAZOUS, P. Exploitation commerciale des bois précédé d'une géographie forestière du globe. **[The commercial exploitation of wood: preceded by a forest geography of the world.]** Dunod, 92 Rue Bonaparte, Paris. 1947. pp. vi + 212. 36 refs. [F.] Price 14*s*.

Contains the following sections:—(1) Forest geography of the world: (*a*) equatorial and tropical, (*b*) the Mediterranean, (*c*) northern temperate, (*d*) boreal (pp. 1–56); (2) the evolution of forest exploitation technique (by the same geographical divisions) (pp. 57–124); (3) the timber trade (including plywood, charcoal, tanstuffs, dyewoods, pulpwood, mining timbers, poles, staves, sleepers) and its organization, weight and measures, dimensions, grades, qualities and defects of timbers etc. (pp. 125–203).

[1069]. 3 (675) : 07.5. DUCHESNE, F. La section économique du musée du Congo belge. **[The economic section of the Museum of the Belgian Congo.]** *Annales du Musée du Congo Belge: Sciences historiques et économiques* 1, 1947. pp. 258. [F.]

A *catalogue raisonné* of that section of the museum devoted to the useful products of the colony, including timber, tanstuffs and rubber, with botanical and other information on the more important species.

[1070]. 3 : 12.26–8 (574). KHOROSHIKH, P. P. Chernŷ topol' v Narŷme. **[*Populus nigra* in the Narym region.]** *Priroda* 37 (2), 1948 (63). 2 refs. [Russ.] A.P.B.

P. nigra grows, chiefly on sandy soils, along several rivers in the N. portion of Tomsk province, where it reaches heights of 13–18 m. and diameters of 40–50 cm. at 40–50 years of age. Occasional large trees reach 25 m. in height and 1½ m. in diam. The bark of 80- to 100-year-old trees is used to make floats for fishing nets etc., being very light and absorbing little water. The Narŷm region is the chief source of such floats in the U.S.S.R., the industry being some 35 years old and producing several thousand tons of bark annually. Wood of young Black Poplars is used for barrel staves, dugout boats and troughs. The burrs of the trunk are valuable for turnery. A dyestuff is obtained from the leaves and bark and 'Harz balsam' from the buds.

31. PROPERTIES AND ANATOMY OF WOOD. WOOD RESEARCH

31.0. *General Information on Woods*

See also *For. Abstr.* 10 (Nos. 872, 877–8, 947, 976, 1232, 1248, 1316–7, 1323).

[1071]. 31.0 : 02.5. TITMUSS, F. H. **A concise encyclopedia of world timbers—a useful work of reference for all users of timber, containing detailed descriptions of nearly 200 different timbers, with macroscopic identifications of the woods in more common use.** The Technical Press Ltd., London. 1948. pp. vii + 156. 74 refs. Price 10*s*. 6*d*.

[1072]. 31.0 (71). **Canadian export timbers, their properties and uses.** The King's Printer, Ottawa. 1948. pp. 71.

[1073]. 31.0 (8) : 01.2. WOODS, R. P. **South American timbers [: notes on characteristics and names].** *Wood* 8 (13), 1948 (221–2).

[1074]. 31.0 (81). BASTOS, A. DE M. As madeiras do Pará—caracteres gerais e caracteres anatômicos. **[Timbers of Pará—general and anatomical characteristics.]** *Arq. Serv. flor., Brasil* 2 (2), 1946 (157–182 + 15 plates). [Port.]

A study of the woods of *Symphonia globulifera, Carapa guianensis, Hura crepitans, Batesia floribunda, Campsiandra laurifolia, Euxylophora paraensis, Pithecellobium racemosum,*

Hymenolobium petraeum, Platonia insignis, Lonchocarpus denudatus, Curatella americana, Tecoma caraiba, Simaruba amara, Didymopanax morototoni and *Jacaranda copaia.*

[1075]. 31.0 (86). **Notes on Ecuadorian timbers.** *Timb. Inform. Timb. Developm. Ass., Lond.* No. 35 [1948?]. pp. 5. 3 refs.

[1076]. 31.0 (88). MENNEGA, A. M. W. **Suriname timbers. I. General introduction, Guttiferae, Vochysiaceae, Anacardiaceae, Icacinaceae.** [*Publication of*] *Natuurwetenschappelijke Studiekring voor Suriname en Curaçao, Utrecht.* No. 3, 1948. pp. 59 + 8 plates. 141 refs. X.

[1077]. 31.0 (943). **New uses [of Queensland hardwoods].** *Rep. Qd. For. Serv. 1946–7*, 1947 (17).

Timbers for which new uses are recommended are *Albizzia thozetiana, Syncarpia subargentea, Dissiliaria baloghioides, Owenia venosa, Flindersia collina, Geissois lachnocarpa, Geijera salicifolia* and *Flindersia bennettiana*, for flooring; *Acacia bakeri* for flooring, cases, and rotary peeling; *Amoora nitidula* for cases; *Siphonodon australe* for boxes and flooring; *Beilschmiedia obtusifolia* (too abrasive for sawing) for peeling; *Banksia aemula* for joinery, *Tristania conferta* for farmers' vats; *Eugenia* spp. and *Tarrietia argyrodendron* for beer-cask staves; and *Syncarpia hillii* for slicing.

[1078]. 31.0 : 12.25. LIANG, H., CHOW, K. Y., and AU, C. N. **Properties of a 'living-fossil' wood** (*Metasequoia glyptostroboides* **Hu et Cheng**). *Res. Note For. Inst. nat. cent. Univ., Nanking* (*Wood Technol.*). No. 1, 1948. pp. 6.

Cf. *For. Abstr.* 10 (No. 1098).

[1079]. 31.0 : 12.25 (73). **American structural woods. 1. The Spruces.** *Timber News* 56 (2108), 1948 (239).

[1080]. 31.0 : 12.25. ERASLAN, I. Dogu Lâdini (*Picea orientalis* Link ve Carr) nin. Teknik vasiflari ve kullanna yerleri hakkinda araştirmalar. **[Oriental Spruce (*Picea orientalis*). Its technical properties and uses.]** Çankaya Matbaasi, Ankara. 1947. pp. 99 + 3 tbls. 43 refs. [Turk.g.]

Describes and tabulates the results of numerous tests on specimens of *Picea orientalis* to determine: average width of annual rings; proportion of late and early wood; specific gravity; density; fibre-saturation point; compressive strength; impact and static bending strength; shrinkage; cellulose, ash and resin content; and fibre length. It is one of the most valuable woods for the manufacture of musical instruments and its properties make it very suitable for aeroplane manufacture and for pulping. A comparison of its properties with those of other Spruces show that it is superior to *P. engelmanni* and very similar to *P. abies, P. sitchensis* and especially *P. rubra.*

[1081]. 31.0 : 12.25. JACQUIOT, C. Étude de bois d'épicéa d'orient. **[Study of the wood of *Picea orientalis*.]** *Rev. Bois Appl.* 3 (1), 1948 (20–2). 8 refs. [F.] P.R.

[1082]. 31.0 : 12.25. Structure et propriétés de bois: pin laricio de Corse, pin sylvestre. **[Structure and properties of timbers: *Pinus nigra* var. *calabrica, Pinus sylvestris.*]** *Rev. Bois Appl.* 3 (2), 1948 (30–2). [F.] P.R.

[1083]. 31.0 : 12.26–8. [GIORDANO, G.] Monographies succinctes: *Apodytes acutifolia*; *Clausenopsis angolensis*; *Manilkara butugi.* **[Brief monographs: *Apodytes acutifolia*; *Clausenopsis angolensis*; *Manilkara butugi.*]** *Bois For. Trop.* No. 6, 1948 (121–30). [F.]

[1084]. 31.0 : 12.25–9. DESCH, H. E. **The Gums.** *Wood* 8 (13), 1948 (230–2).

Liquidambar styraciflua, Nyssa sylvatica, Eucalyptus globulus, E. maculata, E. citriodora, E. regnans, E. paniculata and *E. pilularis.*

[1085]. 31.0 : 12.26–8. **Properties of Australian timbers.** *For. Prod. News-Lett. C.S.I.R.* Nos. 162–3, 1948 (2; 4).

Brown Barrel (*Eucalyptus fastigiata*), Gully Gum (*E. smithii*); Alpine Ash (*E. gigantea*).

[1086]. 31.0 : 12.26–8. LAMB, G. N. **Foreign woods—origin, use, properties and nomenclature.** *Wood Prod.* 53 (5; 7), 1948 (30; 24).

(*a*) Sipo (*Entandrophragma utile*); Tigerwood (*Lovoa klaineana*); Zebrawood (*Brachystegia* sp. or *Cynometra* sp.).

(*b*) Chen Chen (*Antiaris africana*); Mayflower (*Tabebuia pentaphylla*); Teak (*Tectona grandis*).

[1087]. 31.0 : 12.26–8. **Specimen woods, Nos. 150–2.** *Suppls.* to *Wood* 13 (6–8), 1948 167–8; 193–4; 222–4).

Katu-bodá (*Cullenia excelsa*); Burma Padauk (*Pterocarpus macrocarpus*); Gedu Nohor (*Entandrophragma* sp.).

[1088]. 31.0 : 12.26–8. JACQUIOT, C. Le chêne rouge d'Amérique. [**American Red Oak** (*Quercus borealis*).] *Rev. Bois Appl.* 3 (7–8), 1948 (11–2). 11 refs. [F.]

[1089]. 31.0 : 12.26–8 (6). NORMAND, D. Notes sur les bois de Zingana et autres Césalpiniées africaines à très petites folioles. [**Notes on Zebrano and timbers of other African Cæsalpiniaceae with very small leaflets.**] *Rev. int. Bot. appl. Agric. trop.* 27 (293, 4), 1947 (139–50). [F.] P.R.

Zebrano, the botanical identification of which has been in doubt, is here considered as the timber of *Microberlinia brazzavillensis* and *M. bisulcata*. The anatomy and properties of the wood of these 2 species and of some other tropical African species of *Tamarindus*, *Tessmania*, *Brachystegia*, *Cynometra*, *Hymenostegia*, *Cryptosepalum*, *Monopetalanthus* and *Zingana* are discussed, with brief notes on their botanical characteristics.

[1090]. 31.0 : 12.26–8 (675) : 01.2. NORMAND, D. Vrais et faux Tchitola du Mayombe. [**True and false 'Tchitola' from Mayombe.**] *Bois For. Trop.* No. 6, 1948 (145–57). [F.]

Includes: (1) a general discussion of the ambiguities and inconsistencies in the commercial nomenclature of timbers; (2) a short monograph on 'Tchitola' (*Pterygopodium oxyphyllum*); (3) notes on the various timbers commonly confounded under the name of 'Tchitola' (*Daniella* spp., *Gossweilerodendron* spp., *Copaifera* spp., *Oxystigma* spp., *Sindora klaineana*, and *Detarium macrocarpum*; and (4) a key for the identification of the various species.

[1091]. 31.0 : 12.26–8 : 33.4. KEEN, G. R. **A West African product—the qualities of Agba—an excellent wood with good working attributes.** *Timb. Tr. J.* 186 (3752), 1948 (698–9).

The wood of Agba (*Gossweilerodendron balsamiferum*) has excellent working properties and a very even texture. In Nigeria the tree attains a height of 150 ft. and 18–20 ft. in girth and is frequently even larger. The stem, which is usually straight and clean and free from buttresses, attains 90–100 ft. in length. The female tree secretes gum in rather larger quantities than the male, but the gum secretion is confined to the sapwood, which is usually about 3 in. wide, and to a small portion of the centre, with occasional seams in the intermediate wood. Wood not taken from an actual seam is in no way affected by the gum, and, because of the size of the logs, prime, clean, wide boards and planks in various thicknesses should be obtainable. Agba has been used in W. Africa with great success for wharf timbers exposed to tropical conditions, for flooring, interior linings for roofs and other purposes.

[1092]. 31.0 : 12.26–8 : 34.2. MARSHALL, E. D. **Utilization of Mesquite.** *Texas Forest Products Notes, Texas Forest Service* No. 3, 1945. pp. 14. 14 refs. P.R.

Discusses the physical and chemical properties of Mesquite wood and the chemical properties of the gum, and considers past uses and possible future commercial use in the fields of flooring, furniture, tannin, pulp and paper, charcoal, plastics, sugars, etc.

[1093]. 31.0 : 12.26–8 (82) : 12.19 : 09.4. TORTORELLI, L. A. Estudio dendrológico de las especies de *Piptadenia* de la flora Argentina. [**A dendrological study of the Argentine species of *Piptadenia*.**] *Rev. argent. Agron.* 15 (2), 1948 (90–112 + 19 photos). [Span.] E.M.B.

A study of *Piptadenia macrocarpa*, *P.* aff. *macrocarpa* (Cebil Moro), *P. excelsa*, *P. rigida* and *P. paraguayensis* in Argentina, with a description of the most important stands (amount of exploitable timber per ha., average and maximum diameters, percentage of diseased trees and number of trees of various diameter classes) a botanical description of each species, an anatomical study of the wood, and a brief account of native uses of the timber.

31.1. *Structure. Anatomy. Identification*

See also *For. Abstr.* 10 (Nos. 1266, 1298, 1388).

[1094]. 31.1 : 01.4. VAROSSIEAU, W. W. **The identification of wood species with the aid of the Hollerith system.** *Repr.* from *Blumea* 6 (1), 1948 (229–42). 15 refs. [E.e.] P.R.

[1095]. 31.1 : 12.25–8 (44). ALLIOT, H. Guide pratique pour la reconnaissance des principaux bois commerciaux de notre pays. I. Conifères. II. Feuillus. [**Practical guide for the identification of the principal commercial timbers of France. I. Conifers. II. Hardwoods.**] *Rev. Bois Appl.* 2 (12), 1947 (29–33 + chart); 3 (1), 1948 (23 + chart). [F.] P.R.

[1096]. 31.1 (51). YU, C. H. **Anatomy of the commercial timbers of Kansu.** *Bot. Bull. Acad. Sinica* 2 (2), 1948 (127–31).

A description of the anatomy of the following timbers:—*Taxus chinensis*, *Pinus tabulaeformis*, *Abies chensiensis*, *Picea asperata*, *P. neoveitchii*, *P. purpurea*, *Tsuga chinensis*, *Juniperus tibetica*, *J. saltuaria*, *Populus davidiana*, *Betula mandshurica* var. *szechuanica*, *Quercus spinosa*, *Q. liaotungensis*, with an identification key.

[1097]. 31.1 (73). HESS, R. W. **Keys to American woods (continued).** *Trop. Woods* No. 94, 1948 (29–52).

The 21st of the series [see *For. Abstr.* 8 (No. 286)], dealing with woods characterized by parenchyma in numerous concentric bands.

[1098]. 31.1 : 12.25. LI, J. Y. **Anatomical study of the wood of 'Shuisha' (*Metasequoia glyptostroboides* Hu et Cheng).** *Trop. Woods* No. 94, 1948 (28–9 + 2 photos). Cf. *For. Abstr.* 10 (No. 1078).

[1099]. 31.1 : 12.25. BROWN, E. A., and EADES, H. W. **Progress report No. 1. Project V–82. Colorimetric delimitation of sapwood and heartwood in Western Hemlock.** For. Prod. Lab., Vancouver. 1948. pp. 12. P.R.

Tests were made with a large number of chemicals to find one which would distinguish between sapwood and heartwood of Western Hemlock (*Tsuga heterophylla*). The most promising indicator found to date is perchloric acid. It is also a good indicator for the Firs, Douglas Fir, Lodgepole Pine, Sitka Spruce and Western Red Cedar. Three other reagents (Benedict's solution, Fehling's solution and ammonium bichromate) proved excellent sap/heart indicators for Douglas Fir. The first two were also successful on Sitka Spruce and Western Red Cedar. Tincture of iodine worked satisfactorily on Douglas Fir. Work is still in progress. *From authors' summary.*

[1100]. 31.1 : 12.26–8. COZZO, D. Anatomía del leño secundario de *Tricomaria usillo* Gill. ex H.et A. [**Anatomy of the secondary wood of *T. usillo*.**] *Repr.* from *Lilloa* 13 1947 (17–21). [Span.e.] X.

The structure of the wood is normal, but there is spiral thickening in small vessels, a phenomenon which also occurs in one other member of the Malpighiaceae.

[1101]. 31.1 : 12.26–8 : 12.14.2 : 12.11.15 MILANEZ, F. R. Canais secretores do marupá. [**An anatomical study of the secretory canals of *Simaruba amara*.**] *Rodriguésia* 10 (20), 1946 (13–40 + 12 plates). 23 refs. [Port.e.]

[1102]. 31.1 : 31.8. WARDROP, A. B., and DADSWELL, H. E. **Contributions to the study of the cell wall. (4) The nature of intercellular adhesion in delignified tissue. (5) The occurrence, structure and properties of certain cell wall deformations.** *Bull. Coun. sci. industr. Res. Aust.* No. 221, 1947. pp. 32 + 6 photos.

(4) 'Delignified section' is used of a section from which only lignin has been removed; 'maceration' is used to indicate cell-for-cell separation of a tissue. Maceration did not occur when delignified cross sections were (*a*) swollen in dilute alkali, floated on to water and contracted by alcohol; (*b*) degraded to the equivalent of Cross-and-Bevan cellulose or α-cellulose. Any tendency to maceration of a delignified section is due to the swelling of the cell walls. It is suggested that intercellular adhesion in delignified tissue is due mainly to mechanical adhesion between the cells and involves elements of the cell walls at least as resistant chemically as Cross-and-Bevan cellulose.

(5) The slip planes and minute compression failures of wood were investigated in relation to: (*a*) their optical properties; (*b*) staining reactions; (*c*) susceptibility to chemical attack; (*d*) distribution and probable mode of formation in the growing tree; and (*e*) their artificial production in timber. *From authors' summary.*

31.2. *Physical Properties*

See also *For. Abstr.* 10 (No. 1479).

[1103]. 31.2 (51). YEE, C. F., HWANG, P. C., and CHEN, C. L. **Mechanical and**

related properties of Chinese timbers. I. Principal timbers of southwestern China. *Tech. Rep. Bur. aeronaut. Res., Chengtu* No. 28, 1946. pp. 27 + 5 gphs., 5 tbls. 26 refs. [Chin.]

Between 1939 and 1946 this Bureau investigated the mechanical and physical properties of 101 species of broadleaved and coniferous trees, mainly with a view to their suitability for aircraft construction. This report summarizes the detailed records given in Technical Reports 4 (*Picea asperata*), 5, 12 (*Juglans regia*), 13 (*Paulownia fargesii*) and 14 *Cryptomeria japonica*) [see *For. Abstr.* 9 (Nos. 265, 270–1, 275, 279)]; tabulates (1) sources of the material, (2) main physical data, (3) mechanical data (by standard methods); and discusses, with graphs, the relationship between (1) basic specific gravity and modulus of rupture, based on determinations of 47 species, (2) basic specific gravity and shearing strength parallel to grain, based on 55 species, (3) growth rate and strength of wood, (4) moisture content and various mechanical properties, for 11 species. Various defects of wood are also discussed and the intra-specific variability of certain important properties illustrated graphically from determinations on 24 trees of *Picea brachytyla* var. *complanata.*

The report concludes with a table giving the salient physical and mechanical properties of 20 species and varieties (including 7 conifer species) considered by the Bureau to be of importance for aircraft construction, and a short Chinese/English glossary of terms used in the text.

31.21. Conductivity

[1104]. 31.21.4 : 07.7 : 12.26–8 : 12.25. HØJENDAHL, K. **Measurements with Schering's bridge of dielectric constant and dielectric loss of different wood species.** *Aarsskr. Vet.- Landbohøjsk.* 1948 (29–41). 3 refs. [E.e.]

[See *For. Abstr.* 8 (No. 2441).] Schering bridges were used to measure dielectric constant and loss of Teak, in axial and radial directions, and of Pine in radial directions. Graphs are given for different water contents at the 2 frequencies 820 and 3200. The dielectric constant increases with temperature and water content, but varies little with frequency. It is larger in the axial than radial direction. The Schering bridge is not suitable for measuring very small or very large losses, but is adequate in a medium range; it is cheap and convenient, suitable for testing wood and other biological materials. *From author's summary.*

[1105]. 31.21.4 : 33.4. Le bois dans la construction: l'isolation des bâtiments. **[Constructional timber: insulation of buildings.]** *Rev. Bois Appl.* 3 (5), 1948 (31–2). [F.]

Gives tables showing the coefficient of thermal conductivity of different materials and a formula for calculating the amount of heat escaping through a homogeneous partition.

31.22. Relation to Water, Air, Gases

See also *For. Abstr.* 10 (Nos. 1107, 1296).

[1106]. 31.22.2 : 01.1 : 31.27. BARKAS, W. W. **Sorption, swelling and elastic constants of the cell wall material in wood.** *Repr.* from *Trans. Faraday Soc.* 42B, 1946 (137–50). 5 refs. P.R.

This paper shows how the sorption and swelling of hygroscopic materials may be used to give quantitative information about their elastic properties. The fundamental theory will be equally applicable to materials which absorb vapours other than water, but the applications will be confined to the sorption of water by wood, for which purpose the subject was originally developed.

In Part I is given the mathematical theory of swelling stresses and the calculation of elastic constants. The equations derived in this section are in differential form and are exact. Mathematical integration is not attempted, the integral values being obtained by the summation of small steps, each of which is based on empirical data. In Part II the use of the theory is illustrated by the calculation of elastic constants of the natural wood and of the wood substance composing the cell walls. Finally, Part III contains a discussion of certain consequences of the theory of swelling stresses such as sorption hysteresis, the instability of capillary spaces on drying, and the limiting value of the adsorption moisture content at the saturation vapour pressure. *Author's summary.*

31.23. Weight. Specific Gravity

See also *For. Abstr.* 10 (Nos. 869, 1108–9, 1469).

[1107]. 31.23 : 31.22.1. GIORDANO, G. Del peso specifico del legno alle varie umidità. **[The specific gravity of wood at various moisture contents.]** *Ricerca scientifica e Ricostruzione* 17 (11), 1947 (1613–17). [It.] P.R.

The author briefly reviews earlier work on the subject and then shows that the Forest Products Laboratory (Madison) formula ($\alpha_{rt} = 28\rho_o$) is not true for all European woods. In general he concludes that, although there is a straight-line relation between specific gravity and moisture content up to 25% moisture content, this cannot be assumed for higher values. For values between 25 and 30% moisture content, the values of specific gravity have been worked out empirically; for values beyond 30%, variation in volume is affected by so many factors that it ceases to be mathematically predictable.

31.27. Mechanical Strength

See also *For. Abstr.* 10 (Nos. 1106, 1187, 1199–1204, 1214–7, 1297, 1312–3, 1377–9).

[1108]. 31.27 : 31.23. AUBRÉVILLE, A. Les essais mécaniques des bois coloniaux africains: leur interprétation par la méthode graphique. **[Mechanical tests of African colonial timbers: their interpretation by means of graphs.]** *Bois For. Trop.* No. 6, 1948 (133–44). [F.]

Based on some 438 tests of 370 species, made at Nogent-sur-Marne and published by the Comité National des Bois Coloniaux [cf. *For. Abstr.* 7 (No. 248)]. The author develops a method of plotting the test values of a given property (e.g. resistance to impact bending, or resistance to compression parallel to the grain) against specific gravity, for a number of species for comparative purposes.

[1109]. 31.27 : 31.23 : 12.26–8. STERN, E. G. **Influence of nonhomogeneity of wood on its strength properties.** *Bull. Amer. Soc. Test. Mater.* No. 147, 1947 (65–72). 7 refs. D.S.I.R.

Describes tests illustrating the variation in specific gravity which may occur within a stick, plank, bolt, tree and species (using Yellow Poplar [*Liriodendron tulipifera*] as the test example) and correlates variations in specific gravity with strength variations. These variations are of decisive influence in design and large numbers of representative specimens should be tested to obtain representative test data.

31.3. *Chemical Properties*

See also *For. Abstr.* 10 (Nos. 899, 1132, 1236–7).

[1110]. 31.3 : 01.4 : 33.32 : 33.39. DORÉE, C. **The methods of cellulose chemistry, including methods for the investigation of substances associated with cellulose in plant tissues.** Chapman & Hall, Ltd., London. 2nd ed., 1947. pp. 543. Many refs. Price 42*s*. P.R.

[1111]. 31.3. SIHTOLA, H. Molekylfraktionering och cellulosans struktur. **[Molecular fractionation and the structure of cellulose.]** *Papp. Trävarutidskr. Finl.* **30** (6, 7), 1948 (90, 95–8; 120–8). 18 refs. [Sw.e.] P.R.

[1112]. 31.3 : 12.26–8. MITCHELL, R. L., ROGERS, S. C., and RITTER, G. J. **Hemicelluloses from Maple holocellulose.** *Industr. Engng. Chem.* 40 (8), 1948 (1528–9). 9 refs. P.R.

Hemicelluloses were removed from air-dried Maple cellulose by consecutive treatments with the following solvents: (1) Water at 95° C. for 1 hour; (2) Na_2CO_3 solution of 2·0% concentration at 20° for 24 hours; (3) NaOH solution at 4·0% concentration at 20° for 24 hours; and (4) boiling 10·0% NaOH solution for 1 hour. The hemicellulose and the corresponding holocellulose residue resulting from each treatment were analysed and the results are tabulated. [Cf. *For. Abstr.* 10 (No. 291).]

[1113]. 31.3 : 12.25 : 12.11.11 : 34.24. PIGMAN, W. W., ANDERSON, E., and LEAF, R. L. JR. **Occurrence of pectic materials in wood.** *J. Amer. chem. Soc.* 70 (1), 1948 (432–3). 6 refs. O.R.S.

Experiments with pectic material from the inner bark of Black Spruce (*Picea mariana*) establish that D-galacturonic acid occurs there in a polymerized form. The authors suggest that this form is similar in structure to citrus pectic acid and that wood pectins in general are closely related to citrus pectins. [Cf. *For. Abstr.* 9 (No. 1616).]

[1114]. 31.3 : 12.25 : 33.32.1. PEW, J. C. **A flavanone from Douglas-Fir heartwood.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1692, 1947. pp. 16 + 1 tbl. 23 refs. P.R.

A new flavanone isolated from Douglas-Fir heartwood was oxidized to quercetin by air and reduced to eriodictyol with zinc dust and HCl. It was found to be partly responsible for the resistance of the heartwood of this species to sulphite pulping. Synthesis was accomplished by reduction of quercetin with sodium hydrosulphite. Naringenin and another new flavanone, 3-hydroxynaringenin, were found in Coigue (*Nothofagus dombeyi*) and Black Cherry (*Prunus serotina*) heartwoods. *From author's summary.*

[1115]. 31.3 : 34.6 : 33.3 : 12.25. RUSSELL, A. **Interpretation of lignin: the synthesis of gymnosperm lignin.** *Science* 106 (2755), 1947 (372–3). [North Regional Research Laboratory, Peoria, Ill.] D.S.I.R.

[1116]. 31.3 : 34.6 : 33.3 : 12.25 : 01.4. JONES, E. J. **The infra-red spectrum of Spruce native lignin.** *J. Amer. chem. Soc.* 70 (5), 1948 (1984–5). O.R.S.

Initial work on the application of infra-red spectroscopy to the problem of lignin structure has resulted in the establishment of the spectrum of Brauns' Spruce native lignin by several different methods of sample preparation. Typical curves are shown and a brief description is given of the film method of sample preparation. Two important points have been established:—(1) The infra-red spectrum of native lignin in film form is essentially unchanged by as much as 10 hours' heating at 100° C. (2) The broad band centred at 3,350 $cm.^{-1}$ for film and Nujol dispersion, and the shift of this band to higher frequency in dioxane solution is indicative of strong hydrogen bonding in lignin.

[1117]. 31.3 : 34.6 : 33.3 : 12.26–8. BREWER, C. P., COOKE, L. M., and HIBBERT, H. **Studies on lignin and related compounds. LXXXIV. The high pressure hydrogenation of Maple wood: hydrol lignin.** *J. Amer. chem. Soc.* 70 (1), 1948 (57–9). 16 refs. [Division of Industrial and Cellulose Chemistry, McGill University.] O.R.S.

A new method has been developed for the extraction of lignin from Maple wood by a hydrogenation-hydrogenolysis procedure. A separation of this extracted lignin from carbohydrate material has been achieved, the purified product being called 'hydrol' lignin. Three new propylphenol derivatives were isolated from hydrol lignin, viz. 3-(4-hydroxy-3, 5 dimethoxyphenyl)-1-propanol, 3-(4-hydroxy-3-methoxyphenyl)-1-propanol and 3-(4-hydroxy-3, 5 dimethoxyphenyl)-propane. These are the first propylphenol derivatives isolated from wood or lignin by hydrogenation, in which a terminal $-CH_2OH$ group is present in the side chain. *From authors' summary.*

[1118]. 31.3 : 34.6 : 33.3 : 12.26–8. PEPPER, J. M., and HIBBERT, H. **Studies on lignin and related compounds. LXXXVII. High pressure hydrogenation of Maple wood.** *J. Amer. chem. Soc.* 70 (1), 1948 (67–71). 15 refs. [McGill University.] O.R.S.

Maple wood-meal was suspended in dioxane containing 3% NaOH and hydrogenated over Raney nickel catalyst, using an initial pressure of 3,000 lb./sq. in. and a temperature of 170°, and complete conversion of the lignin portion of the wood into chloroform-soluble products was effected. From the reaction mixture three new lignin aromatic degradation products were isolated: 4-hydroxy-3-methoxyphenylethane, 4-hydroxy-3, 5-dimethoxyphenylethane, and 2-(4-hydroxy-3,5-dimethoxyphenyl)-ethanol in yields of 2·2, 15·4 and 6·2% (based on the Klason lignin content of the wood), respectively. The syntheses of 4-hydroxy-3-methoxyphenylethane, 4-hydroxy-3,5-dimethoxyphenylethane and 2-(3, 4, 5-trimethoxyphenyl)-ethanol were accomplished. The isolation of these lignin derivatives thus provides further confirmatory evidence for the essentially aromatic (alkylphenolic) nature of lignin; and for the belief that lignin of hardwoods is composed of units of both the guaiacyl and syringyl types, compounds containing the latter type being the more readily isolated. The isolation of 2-(4-hydroxy-3,5-dimethoxyphenyl)-ethanol as a lignin degradation product provides some evidence for a carbon-oxygen linkage through the β-carbon atom of the alkyl side chain. *Authors' summary.*

[1119]. 31.3 : 34.6 : 33.3. BAKER, S. B., EVANS, T. H., and HIBBERT, H. **Studies on lignin and related compounds. LXXXV. Synthesis and properties of dimers related to lignin.** *J. Amer. chem. Soc.* 70 (1),

1948 (60–3). 17 refs. [McGill University.] O.R.S.

[1120]. 31.3 : 34.6 : 33.3. BAKER, S. B., and HIBBERT, H. **Studies on lignin and related compounds. LXXXVI. Hydrogenation of dimers related to lignin.** *J. Amer. chem. Soc.* 70 (1), 1948 (63–7). 11 refs. O.R.S.

Three dimeric compounds, containing linkages similar to those in the complex structure of native lignin, were hydrogenated under similar conditions to those used in the hydrogenation of Spruce wood. The ether-linked dimers cleaved at the ether linkage, yielding products similar to those found in the reaction mixture after hydrogenation of Spruce wood. The carbon-to-carbon-linked dimer did not yield fission products although nuclear reduction occurred. This apparently substantiates the opinions of Hibbert that dimeric, trimeric etc., substances obtained by the hydrogenation of wood do not arise through the carbon-to-carbon cleavage of similar but more complex polymers. It would therefore appear that these more complex substances exist as such in the wood prior to the hydrogenation reaction. *Authors' summary.*

[1121]. 31.3 : 12.26–8. BLAND, D. E., HANSON, E. A., STEWART, C. M., and WATSON, A. M. T. C. **The extraction of lignin from *Eucalyptus regnans* F. v. M. by means of methanol.** *J. Coun. sci. industr. Res. Aust.* 20 (4), 1947 (553–63). 12 refs. O.R.H.

In experiments in the methanol extraction of native lignin from sawdust of immature *Eucalyptus regnans*, treatment for 24 hours at 150° C. removed a little more than ¼ of the lignin present, estimated as Klason lignin. Treatment for 148 hours, using fresh methanol every 16 hours, removed about 70% of the original lignin estimated as Klason lignin. There was evidence that the methanol extraction of wood is essentially a mild acid hydrolysis accompanied by the solvent action of methanol. During the process some of the extracted lignin was degraded to materials soluble in water and ether. The remainder could be precipitated as a buff powder which gave the colour reactions of native lignin, and proved soluble in bisulphite solutions. *From authors' summary.*

[1122]. 31.3 : 34.6 : 33.3. FREUDENBERG, K. Die Herkunft des Formaldehyds aus dem Lignin. **[The origin of formaldehyde in lignin.]** *Chemische Berichte* 80 (2), 1947 (149–158). 21 refs. [G.g.] L.S.

Discusses the question whether the formaldehyde which is split off from lignin by the action of acids and alkalis has its origin in aromatic methylene-dioxy-groups or terminal (free or etherified) carbinol groups. It is probable that the latter is the case and the author demonstrates that formaldehyde is more likely to be split off by those free or etherified 1-phenyl-propan-3-ols which have two further hydroxyl groups in the side chain or a carbonyl oxygen near to the benzene nucleus. Many hydroxybenzyl alcohols and their ethers also split off formaldehyde. *From author's summary.*

[1123]. 31.3 : 33.3. ENKVIST, T. Svavellignin med hög halt av svavel. **[Sulphur lignins with a high sulphur content.]** *Svensk PappTidn.* 51 (10), 1948 (225–9). 10 refs. [Sw.e.g.] P.R.

Describes the properties and composition of thiolignins extracted by 3 different methods.

[1124]. 31.3 : 34.6 : 33.3 : 12.25. BRAUNS, F. E., and BUCHANAN, M. A. **Acetic acid Spruce lignin and acetic acid Willstätter Spruce lignin.** *J. Amer. chem. Soc.* 67 (4), 1945 (645–9). 5 refs. [Institution of Paper Chemistry, Appleton.] O.R.S.

No new hydroxyl groups are formed when lignin is extracted from Spruce by means of acetic acid.

[1125.] 31.3 : 12.25–8 (73) : 33.32. KURTH, E. F. **Chemical analysis of western woods. Part I.** *Paper Tr. J.* 126 (6), 1948 (56–7). 4 refs. P.R.

Four species of western hardwoods [*Rhamnus purshiana, Cornus nuttallii, Arbutus menziesii, Umbellularia californica*] and 3 species of western softwoods [*Pseudotsuga taxifolia, Juniperus occidentalis, Taxus brevifolia*] were analysed for ether, alcohól, and water extractives, holocellulose, lignin, methoxyl group and ash content in accordance with the applicable TAPPI Standard Procedures. Pentosan determinations are made in accordance with the method of the Association of Official Agricultural Chemists. The holocellulose and lignin procedures gave products amounting to

100% of the moisture-free weight of the extractive-free woods. *Author's summary.*

[1126]. 31.3 : 12.25 : 34.24 : 33.39 : 34.6. CLARK, I. L., HICKS, J. R., and HARRIS, E. E. **Extractives of Douglas Fir and Douglas Fir lignin residue.** *J. Amer. chem. Soc.* 69 (12), 1947 (3142–3). 2 refs. [U.S. Forest Products Laboratory, Madison, Wis.] O.R.S.

Gives the results of preliminary investigations into the nature of extractives from Douglas Fir lignin residues (from dilute acid hydrolysis) and from Douglas Fir bark and sapwood. [Cf. *For. Abstr.* 10 (No. 1338).]

31.4. *Durability. Decomposition*

31.42. Attack by Plant Organisms

See also *For. Abstr.* 10 (Nos. 1246–7).

[1127]. 31.42.11 : 12.26–8 : 12.11.3. PRESTON, A. **On intraspecific variability of Eucalyptus timber to fungal rotting.** *Emp. For. Rev.* 27 (1), 1948 (133–5). 3 refs.

An experiment was made on wood of *Eucalyptus rostrata* (a very resistant species) and *E. regnans* (very susceptible), using in each case wood from 3 trees from each of 3 provenances, in order to determine the degree of variability within a species in the matter of susceptibility to rot fungi. It is concluded that for durable timbers like *E. rostrata*, test specimens may be taken from single trees. For susceptible timbers like *E. regnans*, a single sample tree from one area cannot be taken as representative for testing fungal effects.

[1128]. 31.42.11 : 12.11.15 : 12.21. NORD, F. F., and VITUCCI, J. C. **On the mechanism of enzyme action. XXIX. The acetate metabolism of certain wood-destroying molds and the mechanism of wood decay.** *Archives of Biochemistry* 14 (1/2), 1947 (229–41). 12 refs. L.S.

A more detailed account of the experiments reported in *For. Abstr.* 9 (No. 1622).

[1129]. 31.42.11 : 12.11.15 : 12.21. NORD, F. F., and VITUCCI, J. C. **On the mechanism of enzyme action. XXX. The formation of methyl-*p*-methoxycinnamate by the action of *Lentinus lepideus* on glucose and xylose.** *Archives of Biochemistry* 14 (1/2), 1947 (243–7). 7 refs. L.S.

The observation that *Lentinus lepideus* acts on wood as well as on glucose or xylose to give rise to methyl-*p*-methoxycinnamate supports the theory that the phase sequence of the decomposition of wood cellulose is initiated by an introductory hydrolysis of cellulose caused by the micro-organism. A preliminary consideration as to the origin of methyl-*p*-methoxycinnamate from glucose and xylose is presented. *From authors' summary.*

[1130]. 31.42.11 : 12.21. THEDEN, G., and SCHULZE, B. Vergleichende Untersuchungen über Zerstörungskraft und Wachstum verschiedener *Coniophora*- und *Merulius*-stämme. **[Comparative research on the destructive power and growth of different *Coniophora* and *Merulius* strains.]** *Wissenschaftliche Abhandlungen der deutschen Materialprüfungsanstalten* 2 (3), 1942 (78–84). 4 refs. [G.g.] P.R.

[1131]. 31.42.11 : 31.42.12. BJÖRKMAN, E. **On the development of decay in building-timber injured by blue-stain.** *Repr.* from *Svensk PappTidn.* 50, [1947]. pp. 4. 17 refs. [E.] P.R.

The effect of blue-stain in timber in inhibiting or encouraging attack by wood-rotting fungi (*Merulius lacrymans*, *Coniophora puteana*, *Poria vaporaria*, *Paxillus panuoides*) and some common storage-decay fungi was investigated. Scots Pine blocks infected, after drying, with *Ophiostoma piceae* and *Pullularia pullulans*, showed about the same resistance to the fungi as dry non-infected wood. The same result was obtained with blocks infected with *Trichoderma lignorum* and the 4 house-decay fungi. Green Scots Pine blocks infected with *Graphium penicillioides* showed slightly greater resistance to attacks by *M. lacrymans* and *C. puteana* than non-infected green blocks.

[1132]. 31.42.12 : 31.22.1 : 31.3. THEDEN, G. Beitrag zum Verhalten der Bläuepilz: die Feuchtigkeitsansprüche eines Bläuepilzes; die Ursache, die ihn am Befall des Kernholzes hindert. **[The behaviour of blue-stain: the moisture demands of a blue-stain fungus; the factors which prevent its attack on heartwood.]** *Wissenschaftliche Abhandlungen der deutschen Materialprüfungsanstalten* 2 (3), 1942 (85–8). 7 refs. [G.g.] P.R.

The following conclusions are drawn from laboratory tests: (1) that blue-stain increases

with moisture content; at 100% relative humidity of the air the attack is rapid and fully developed, while at 96·5% there is no effective attack and at 92·4% the fungus cannot grow; (2) the reason for its not attacking the heartwood is not lack of moisture but must be attributed to a chemical change in the cells of the medullary rays, making these unsuitable as culture media. *From author's summary.*

31.43. Attack by Animal Organisms

See also *For. Abstr.* 10 (No. 959).

[1133]. 31.43 : 33.36.1 : 13.2. HATFIELD, I. **Powder post beetles and their control.** *Pests* 16 (5), 1948 (23–31). 5 refs. P.R.

A description of wood-destroying beetles of the Anobiidae, Bostrichidae, Lyctidae and Cerambycidae, with a comparison of different preventive and control methods.

[1134]. 31.43 : 12.26–8 : 13.2 : 32.22. FOUARGE, J. L'attaque du bois de Limba (*Terminalia superba* Eng. and Diels) par le *Lyctus brunneus* Le C. **[Attack by *Lyctus brunneus* on the wood of *Terminalia superba*.]** *Publ. Inst. nat. Étude agron. Congo Belge* (*Sér. sci.*) No. 36, 1947. pp. 17. 17 refs. [F.]

High ring-barking in order to deplete starch reserves is recommended as probably the most promising method of protecting this very susceptible timber from *Lyctus* attack. Hydrolysis of the starch can be effected by immersing the wood in a weak solution of HCl, but this (1) discolours the wood, and (2) also hydrolyses the cellulose if immersion lasts long enough for the heartwood to be penetrated. It might, however, be practicable for treatment of veneers if discoloration were no disadvantage.

[1135]. 31.43 : 13.2. CORMIO, R. Difetti dei legnami: i silofagi marini. Parte prima: Biologia delle teredini. **[Defects of wood: the marine borers. Part I. Biology of the teredos.]** *L' Ingegnere* Nos. 9; 10; 11, 1947 (648–57; 734–42; 819–23). 39 refs. [It.] X.

[1136]. 31.43 : 13.2 : 33.36.1 : 31.41. BRYAN, J. **Deterioration of structures of timber, metal, and concrete exposed to the action of sea-water. 19th report: being a general summary of the experimental work carried out to date on timber.** Institution of Civil Engineers, London. 1947. pp. 49.

Summarizes results of long-term exposure of various treated and untreated timbers to marine-borer attack under service conditions at points in Great Britain, Bermuda, Jamaica, E. and W. Africa, Ceylon, Mauritius, Malaya, Australia and New Zealand. The following conclusions are drawn:—(1) no timber is naturally immune to marine-borer attack but some species—e.g. Greenheart (*Ocotea rodiaei*), Pyinkado (*Xylia dolabriformis*), Turpentine (*Syncarpia laurifolia*), Totara (*Podocarpus totara*), and Jarrah (*Eucalyptus marginata*)—are highly resistant and under many exposure conditions may be considered practically immune; (2) creosote is the most satisfactory preservative so far tested, but incomplete tests with 'Celcure' indicate that it might prove equally effective; (3) deep impregnation with the preservative, with previous incision of the timber if necessary, is essential; (4) in home waters, any species effectively impregnated will be immune to borer attack; and in tropical waters will be highly resistant to attack and have a service life of many years; (5) owing to extremes of variation in the intensity of attack by *Teredo*, *Limnoria*, *Chelura*, etc. on timbers at various ports at home and in tropical waters, it is desirable that preliminary tests should be made at all ports where timber is to be used.

31.8. *Quality and Defects of Timber*

See also *For. Abstr.* 10 (Nos. 899, 1066, 1102).

[1137]. 31.8. Anomalies, défauts et vices des bois. **[Abnormalities, defects and flaws in timber.]** *Bull. Soc. for. Belg.* 55 (2), 1948 (72–82). [F.]

Definitions drawn up by a sub-committee of the Belgian Association for the testing of materials. Defects are classified as due to (1) growth conditions, (2) inorganic agencies (including logging damage), (3) insects, (4) fungus, mistletoe, etc. For each defect, definition, cause, consequences, and external signs (if any) are given.

[1138]. 31.8 : 12.26–8. **Quality of Meranti Tembaga from different areas.** *Malay. Forester* 11 (3), 1948 (128).

Measurements of specific gravity and of the extent of spongy heart were made on discs of *Shorea leprosula* from several areas. Tentative conclusions from the investigations were:—(1) The timber from Merlimau is of better quality than that from Senawang and slightly better than that from Kepong. (2) There is no distinctive difference between fast and slow grown timber, but timber from young trees is much inferior in quality to that from more mature trees. (3) There is little difference in the specific gravity of timber from the foot of the bole up to 50 ft., but the extent of spongy heart decreases appreciably beyond 10 ft. above the ground where it appears to be at its maximum.

[1139]. 31.8 : 34.26 : 12.25 : 33.4 : 33.5. [MACHADO, J. C.] Quais valem mais: madeiras resinadas ou por resinar? **[Which is more valuable: timber from tapped or untapped trees?]** *Pinhal e Resina* 1 (3), 1948 (26–7). [Port.e.] [Grémio da Lavoura de Monção e Valença.]

Replies to a questionnaire on the utilization of timber from trees subjected to resin-tapping indicate that no preference is given to such timber in Portugal, as it is in France. While it is used without prejudice for mining timbers, temporary constructions and railway sleepers, for permanent constructions it is often rejected. Experiments have shown, however, the special suitability of tapped timber for flooring, owing to its greater dimensional stability.

32. HARVESTING OF WOOD. LOGGING

See also *For. Abstr.* 10 (Nos. 967, 983, 988, 1051).

[1140]. 32 (85) : 12.26–8 : 23.2. HOY, H. E **Mahogany industry of Peru.** *Econ. Geogr.* 22 (1), 1946 (1–13). O.G.

About 400,000 sq. mi., nearly two-thirds of the area of Peru, is forested. The range of Mahogany (probably *Swietenia mahagoni*) is very great, but density varies widely. Trees may be one or more to the acre, or a mile or more apart. Exploited areas are widely scattered. Trees are usually cut under licence by an independent logger, rafted down the river, and sold to the mill of his choice. An account is given of the methods of felling, transport, milling and marketing. Most of the trees cut average 3 ft. in diameter at the cutting height. It is difficult to determine their age, owing to the absence of annual rings, but mill operators estimate that 36-in. logs are 60–100 years old. Trees grow rapidly in early life and in a fast-growing area the smallest tree that may be legally cut (18-in. diameter) might be only 20 years old. The Peruvian government has adopted a reforestation programme which obliges the logger to plant 2 trees for every one he cuts, but the Forest Service find it difficult to enforce this law. It is suggested that the future of the industry may lie in the extension of plantations, such as those already started by two lumber firms, where 10,000–15,000 trees are now growing. These trees have grown to heights of 25 ft. in 10 years and should reach maturity in about 40 years.

[1141]. 32 : 02.2. **Fundamentals of logging.** Allis-Chalmers Mfg. Co., Milwaukee, Wis. 1948. pp. [8] + 96.

A logger's pocket book, containing information on logging procedures, terms in common use, wire rope and guys, log scaling, etc., and the use and estimated cost of owning and operating tractors and other mechanical logging equipment.

[1142]. 32 : 07.7 : 33.02 (71) : 82. GIROUARD, J. **Mechanized logging at Forestville.** *Pulp Paper Mag. Can.* 49 (7), 1948 (111–4).

An account of methods and machinery used for pulpwood logging by the Anglo-Canadian Pulp and Paper Mills Ltd. at Forestville. Felling strips are mapped out at right angles to the hauling roads and the trees are felled in strips about 50 ft. wide by 400 ft. long so that they fall in a herringbone pattern with the V pointing towards the hauling road. The tree lengths are hauled in and piled in bundles by an operation involving the use of wire cables and a 35-ft. steel-reinforced Spruce 'gin' pole or spar. A sulky skids the bundles to the sawing site, where they are cut into 4-ft. lengths by three power-driven circular saws, mounted on a steel framework alongside a roller conveyor. In summer the lengths are dumped directly into the river. In winter they are carried and piled on the ice. Details of equipment and of a prefabricated logging camp are also included.

[1143]. 32 : 07.7 (470). BELINSKI, A. A. K voprosu o tsentralizovannom elektrosnabzhenii lesozagotovok. **[Centralization of the**

supply of electricity for logging.] *Lesnaya Prom.* 1948 (2), (10–11, 14). [Russ.]

Stresses the advantages of centralizing the power supply, e.g. by tapping the general grid [cf. *For. Abstr.* 10 (No. 314)] or using mobile power stations rather than small independent generator units.

Data collected by Pechenkin and Terekhin showed that skidding (in this case by winch and cable) accounted for 1·15 out of a total of 2 kw-hrs./cu.m. of outturn in electrified logging work, and in considering centralization of the power supply, selection of the best skidding technique is the vital factor. Figures for the power consumption at which a centralized supply is estimated to become economic vary from 1·7 to 2 kw hrs./cu.m. of outturn.

Of several forms of electrified skidding which have been tried, the two most successful are:—(1) The 2-drum winch as used by Pechenkin and Terekhin, having a 29-kw motor, a traction power of 2·5 metric tons and a radius of operation in endless-cable (ground) skidding of 350 m. A sector of 0·7–0·8 ha. is worked, and the tackle shifted to an adjacent sector, every 2–3 days, but the winch can remain in the same position for 2 weeks. In the author's trials of this method, the appropriate lay-out for which is illustrated diagrammatically, the outturn was 7·8 cu.m./man-day in winter and 7·1 in summer. The method is especially useful where topographical conditions make the use of an electrically driven tractor impossible.

(2) The most effective method, where feasible, is believed to be the use of electrically driven tractors supplied with power by a flexible cable. Ordinary tractors are easily converted to electric operation. Skidding with a standard tractor equipped with a 32-kw motor gave an outturn per man-day of 11·5 cu.m. in winter and 10·4 in summer. The lay-out of such an operation is illustrated.

With a central power supply, special means are necessary to serve the mobile machinery on the logging area. Mention is made of: (*a*) Light wooden standards to carry temporary power lines over rocky or boggy ground. (*b*) Mobile transformers, with an output of up to 50 kw, mounted on sledges, etc. (*c*) Use of separate transformers for electric saws, giving for these an L.T. supply at 236 volts, while the remaining machinery could work at 380 or even 500 volts. This is usually the only possible solution when electric tractors are used, since the reel for the flexible power cable holds 550 m. of 380-volt, but only 200–250 m. of 220-volt cable.

[1144]. 32 : 07.7 (470). SULIMOV, A. N. Elektrifitsirovannaya zagotovka lesa ot vysokovol'tnoy seti. [**Electrified logging supplied from the high-voltage grid.**] *Lesnaya Prom.* 1948 (3), (8–10). [Russ.]

Deals briefly with successful trials, from which it is concluded that a power supply from the general H.T. grid is superior to decentralized supply from mobile L.T. power generators in consistency and cheapness of current, manpower required to service lines and machines, independence of season and weather, elimination of the need for petrol to drive small power units, economy in actual power consumed, and adequacy of the supply for multiple use (not only for the various machines but also for lighting log depots, logging camps etc.).

Logging enterprises should consult the regional electricity boards about the possible means of securing power from the H.T. lines, and the Ministry of Forest Industry should design suitable standard equipment and arrange for its manufacture.

32.2. *Felling and Related Operations*

See also *For. Abstr.* 10 (Nos. 988, 1134).

[1145]. 32.25 : 07.7. VEKSHEGONOV, V. YA., and PAVLOV, E. A. Elektropilŷ povŷshennoy chastotŷ toka i ikh proizvodstvenno-tekhnicheskaya kharakteristika. [**Electric saws operated on higher-frequency current, their performance and technical characteristics.**] *Lesnaya Prom.* 1948 (2), (20–3). [Russ.]

Reports on trials of 2 new electric chain saws: (1) An improved model of Kharlamov's 1-man saw [see *For. Abstr.* 8 (Nos. 324–5); 9 (No. 952)] operating on 220–240 volt A.C. (175–200 cycles), with a power consumption of 1 kw, a motor speed of 10,000 revs./min., a chain speed of 6·5 m./sec., a kerf of 4·5 mm., and weighing 8·4 kg. (2) A 1-man saw (the YaLP) made by the Likinsk works, of different construction but similar characteristics, the chief differences being its higher power (about 1·6 kw), chain speed (7·1 m./sec.), kerf (6·0–7·1 mm.) and weight (8·8 kg.). Characteristics and performances of these saws are tabulated and compared with those of the VAKOPP type, to

which both of the new types proved superior. Figures are included to show rate of cutting (in sq. cm./sec.) of all 3 types as influenced by diameter and species (Birch, Norway Spruce, Aspen). The average output per saw per shift [? 8 hours] was 11·8 cu.m. for the Kharlamov and 10·5 for the Likinsk saw. Both types proved very satisfactory in action. Kharlamov's saw gave the best performance, but owing to its construction is suitable for work only up to diameters of 50–60 cm., while the Likinsk model could be used for larger timber. With a few minor constructional modifications, both types are recommended for mass production.

[1146]. 32.25 : 07.7 : 82 (470). PLINER, L. A. Elektrifitsirovannaya zagotovka lesa potochnŷm metodom. [**Electrified logging by a continuous method.**] *Lesnaya Prom.* 1948 (3), (6–7). [Russ.]

A special gang of 4 men clears dead and defective trees, undergrowth etc., in advance. The actual work of logging is done by 3 independent gangs of 13, working along suitably spaced marked strips, 2·5 m. wide and divided into 'sectors' 50 m. long. Each gang consists of a foreman (the operator of an electric felling saw) and 4 parties of 3 men each; 3 parties assist in felling and trimming, the fourth being responsible for crosscutting and measuring.

The work is staggered by sectors to give a continuous flow of operations and at the end of a working day the foreman fells trees in 2 successive sectors to provide work for the start next day. Diagrams of the lay-out of operations are included and timings for felling and crosscutting are tabulated.

The output per man-day was 10·8 cu.m. [Cf. *For. Abstr.* 9 (Nos. 1635-6).]

[1147]. 32.25 : 07.7. [**The 'Quick' chain saw.**] *Skogen* 35 (8), 1948 (90). [Sw.]

Cf. *For. Abstr.* 8 (No. 2474). A few further details are given of this saw. The model demonstrated had a 2-stroke motor of about 8 h.p., fed by a fuel tank holding about 3 litres (sufficient for 1½ hours' running). Cutting can be done practically at ground level, leaving very low stumps. The present weight (40 kg.) is considered too high. A semi-automatic disc-type sharpener (illustrated) can be coupled to the motor by a flexible tubular transmission. The saw costs Kr. 2,800 and the sharpener Kr. 385.

[1148]. 32.25 : 07.7 : 01.1 : 33.1. VIL'KE, G. A. Rabota skalŷvayushchego zuba v poperechnŷkh pilakh. [**The work of the raker teeth in cross-cutting saws.**] *Lesnaya Prom.* 1948 (3), (11–4). [Russ.]

From a purely mathematical analysis of the action of scribing and raker teeth as influenced chiefly by their relative height and kerf width, it is concluded that there is a minimum width of kerf below which all the work will be done by the scribing teeth, and that this limit will be reached earlier with conifers than with hardwoods. In chain saws with a kerf of 7–8 mm. the height at which raker teeth exert a normal shearing action varies within rather wide limits, between which the scribing teeth will cross-cut along the walls of the kerf and the raker teeth will plane its bottom. In two-handed cross-cut saws the raker teeth, the height of which must be more accurately adjusted (to a precision of ± 0·2 mm.), do only part of the shearing work, and the scribing teeth the rest. In bow-saws the limit of accuracy for the height of raker teeth (± 0·1 mm.) is not attainable under practical conditions, and as they are filed comparatively short to avoid their attacking fibres not yet severed by the scribing teeth, the latter perform the cutting of both the sides and bottom of the kerf.

[1149]. 32.25 : 07.7. Hur vill Ni ha bågsågen konstruerad. [**How would you like your bow-saw made?**] *Skogen* 35 (12), 1948 (146–7). [Sw.]

Tentative standard dimensions for 3 types of bow-saw are presented in tables and diagrams. Comment is invited from users.

[1150]. 32.25 : 12.25. ZASADA, Z. A. **Time required to cut Black Spruce trees.** *Tech. Notes Lake St. For. Exp. Sta.* No. 291, 1948. pp. 2.

A table gives time required for the various operations in cutting Black Spruce trees of various diameters to 3 top utilization standards.

[1151]. 32.25 : 82. WILSON, M. R. **The value of sawing contests in labour relations.** *Pulp Paper Mag. Can.* 49 (6), 1948 (102, 104).

Sets out the rules for such contests and summarizes the benefits derived from them by both workers and industry.

[1152]. 32.25.2. SIMMONS, F. C. **Good logging practice. No. 8. Pointers on felling trees.** *Timber of Canada* 8 (10), 1948 (40–3, 74).

[1153]. 32.25.3 : 32.25.4. **Good logging practice. No. 9. Limbing and bucking the tree.** *Timber of Canada* 8 (11), 1948 (40–3, 78, 81).

[1154]. 32.25.5 : 01.4. WENZL, H. Studien über die Reibungs- und Wasserstrahl-Entrindung und ihre Anwendungsmöglichkeiten für mitteleuropäische Holzverhältnisse. **[Studies on the removal of bark by friction and hydraulic action and their utility in Central Europe.]** *Holzforschung* 1 (4), 1947 (112–20); 2 (1), 1948 (12–20). 51 refs. [G.g.] P.R.

Discusses (with tables) the chemical composition and estimated average thickness of bark of different species. Considers the effect of floating on bark removal; and describes various processes of pre-treatment by soaking for different periods under different conditions and various methods of barking by friction and hydraulic action, giving a table showing the output, and the consumption of labour, power and water for different combinations of pre-treatment and method used.

[1155]. 32.25.5 : 07.7. GOY, O. **Economical debarking of wood: 2 new debarking machines.** *Paper Tr. J.* 126 (25), 1948 (59–60). P.R.

Describes 2 barking machines: (1) used by the G. Haindl'sche Papierfabrik, where the logs are placed in a drum and subjected to the action of high pressure water jets, after preliminary soaking in warm water for 8 hours; (2) a peeling machine for Beech wood designed by the Waldhof cellulose works. Peeling is effected by 2 rotating beating disks. The bark is most easily removed within 3 weeks of felling.

[1156]. 32.25.5 : 07.7 (71). SMITH, I. W. **Mechanical methods of bark removal.** *Paper Tr. J.* 126 (23), 1948 (45–50). 13 refs. [University of Toronto, Ontario, Canada.] P.R. Also as *Prepr. U.S. For. Prod. Res. Soc.*, 1948, pp. 10; and in *Sth. Lumberm.* 176 (2209), 1948 (74–6, 78).

Lists and describes barking machines using: (1) cutter knives, (2) friction, and (3) hydraulic action, in use in Canada.

[1157]. 32.25.5 : 32.22 : 24.31. MCINTOSH, D. C. **Chemical treatment of trees.** *Pulp Paper Mag. Can.* 49 (7), 1948 (117–8, 120).

Experiments were made during the summer of 1947 at Stevens, Ontario, to find the effect of 3 chemical treatments—(1) a soluble arsenic compound, (2) ammonium sulphamate and (3) a mixture of soluble arsenic and ammonium sulphamate, all applied by girdling—and of the times of treating and felling, on the ease of barking logs, and on the moisture content of the wood. Six species of tree were treated, the broadleaved species being given a fourth treatment with the sodium salt of 2,4–D. Trees were treated at 4 different times, viz. in June, July, August and September, and samples of each were felled in each subsequent month for 4 months. Results for *Pinus banksiana* and *Populus tremuloides* are given. Trees treated in June and July were more easily barked than those treated in August, while September treatments gave no improvement. Studies in the relative effectiveness of the chemicals corroborated the results of the 1946 Petawawa experiments [cf. *For. Abstr.* 6 (240); 8 (No. 2477)]. In *Pinus banksiana* a difference in weight and moisture content was noted in material from the tops and that from below a line 12 ft. above the stump; no appreciable drying effect was found in Aspen. In both species, however, there was a concentration of moisture between the stump and the girdle. Ammonium sulphamate gave the quickest drying effect in Jack Pine with trees treated in July and felled 2 months later. Blue stain occurred in the sapwood of chemically treated Jack Pine, being most severe in trees treated with (2). Preliminary transpiration studies suggest that drying comparable with or better than that resulting from chemical treatment can be achieved by felling trees and leaving them with their leaves on for some time before cutting to pulpwood lengths.

[1158]. 32.26 : 32.82 (470). SHABRIN, N. Tipizatsiya lesnykh skladov i baz. **[Typification of timber depots.]** *Lesnaya Prom.* 1948 (2), (15–9). 6 refs. [Russ.]

Discusses, with a view to clarifying the possibilities of rationalization, the flow of operations involved in logging, initial conversion, transport and storage of wood and timber. Distinguishes 4 main types of timber depot according to their situation and the

phases of conversion and disposal of products which they serve, and provides for further subdivision of these categories according to volume of material handled and type of transport by which they are served. Considers the equipment and power needed in, and illustrates with diagrams the lay-out of, several typical timber depots.

[1159]. 32.29 (711) : 32.9 : 07.7. SMITH, R. E. **Commercial relogging in British Columbia.** *W. Cst. Lumberm.* 75 (6), 1948 (58–9, 127–8).

The necessary conditions for a profitable relogging operation include the following:— (1) The recoverable material should not be less than 1,000 cu. ft./acre over the whole area. (2) Pulp species (Hemlock, Balsam, and Spruce) should constitute at least 75% of all the material available. (3) Relogging limited to 2 years after felling for Balsam and 3 years for Hemlock and Spruce, after which the amount of decay is excessive. (4) Reasonable hauls; towing distances up to 300 miles are practicable if material is bundled. Special yarding equipment is now available but the problem of loading a large number of small pieces has yet to be solved satisfactorily. Some details are given of equipment used in an actual operation.

[1160]. 32.29 : 07.7 : 23.22. **Land clearance equipment for East Africa.** *Engineering* 165 (4296), 1948 (513–4) [cf. *For. Abstr.* 10 (No. 310)]. D.S.I.R.

32.7. *Loss in Logging. Incidental Waste*

[1161]. 32.7 : 34.6 : 33 (73). BAILEY, L.F. **Wood wastes in the Tennessee Valley and their chemical utilization.** *Journal of the Tennessee Academy of Science* 22 (2), 1947 (94–8). L.S.

32.8. *Grading and Storage of Wood in the Rough*

See also *For. Abstr.* 10 (Nos. 1158, 1246).

[1162]. 32.81 : 12.26–8. BRATTON, A. W. **Hardwood log grading and lumber value.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 14, 1948. pp. 6.

A study of hardwood log-grading rules (drawn up by the Forest Products Laboratory, Madison) in use at the Otsego Forest Products Cooperative Association, Cooperstown, N.Y.

[1163]. 32.81 : 33.17 : 33.91 (777). KELLOGG, L. F. **Preliminary report of yields of lumber by grades from Iowa timber.** *Sta. Notes Cent. St. For. Exp. Sta.* No. 43, 1948. pp. 2.

Tables show the average yield of timber (by grades) obtained from logs of White Elm [*Ulmus americana*], Cottonwood [*Populus deltoides?*] and Northern Red Oak [*Quercus borealis maxima*], the logs being divided for the study into 3 grades on the basis of diameter, length, surface appearance and defects.

32.9. *Transport*

See also *For. Abstr.* 10 (Nos. 988–9, 1159).

[1164]. 32.9 : 33.02 : 76. PATCH, C. E. **Experiences with pulpwood handling and accounting.** *Paper Tr. J.* 127 (3), 1948 (62–5).

Discusses, with graphs, some of the factors in handling pulpwood which may affect its cost, and indicates the need for a fuller study of the subject.

[1165]. 32.9 : 33.02 : 82. ARCHER, D. H. **Labor requirements for yarding and hauling pulpwood.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 13, 1948. pp. 5.

A time study of an efficient job of yarding and hauling 4-ft. lengths of Aspen pulpwood in Connecticut. Man-minutes per cord for the total operation (yarding, hauling and loading) amounted to 93.

[1166]. 32.91 : 07.7. **Something new for winter transportation.** *Canada Lumberm.* 67 (13), 1947 (72).

Account of a motor-toboggan manufactured by the Four Wheel Drive Auto Co. of Kitchener, Ont. The toboggan, about 12 ft. long and 3 ft. wide, is powered by a 4-cycle, 25-h.p., air-cooled engine which drives a caterpillar-type tread running down through the centre of the toboggan and forming a complete circular belt. The entire track assembly can be raised or lowered to exert pressure on the track in deep or soft snow and release pressure on packed or crusted snow. It has 2 bucket-type seats and can tow a loaded toboggan of 500 lb. It should be of the greatest use in woods operations where other forms of transport are immobilized by heavy snow.

[1167]. 32.91.12 : 07.7 : 33.02. **New winch for pulpwood logging.** *Canada Lumberm.* 67 (15), 1947 (53).

Account of the 'blue ox' winch co-operatively designed by the Canadian International Paper Co., Montreal, and the Hayes-Lawrence companies, Vancouver. Under the most adverse, brushy conditions, the new winch produced more than 45 cords per day over a period of 2 weeks' trial operations; it can bring in as much as 500 bd. ft. at a time over a distance of 1,000 ft. A feature of the design is an 'A' frame permanently attached to the sled; once the rigging is installed it requires no attention beyond occasional replacements.

[1168]. 32.91.12 : 07.7. KELLY, J. L. **Aluminium sleigh.** *Woodl. Sect. Index Canad. Pulp. Pap. Ass.* No. 976 (B–8–d), 1948. pp. 2.

Progress report on the design of an aluminium skidding sleigh by Price Brothers & Co. The total weights of various models of aluminium and aluminium-and-wood construction are 603–719 lb. compared with 1,010 lb. for the conventional wooden sleigh.

[1169]. 32.91.12 : 07.7 (470). ROOS, L. V. Trelevochnȳ traktor KT–12. **[The KT–12 skidding tractor.]** *Lesnaya Prom.* 1948 (4), (8–14). [Russ.]

A detailed account, with specification, photographs and scale diagrams, of a new producer-gas-driven caterpillar tractor, mass production of which is starting in 1948. In 21 days of service trials under very difficult conditions this machine skidded 803 cu.m. of timber over a distance of 800 m. Its normal daily skidding capacity is estimated at 50 cu.m. of timber (5 cu.m. per trip) for a distance of 500 m. The machine weighs 5,600 kg. and has a clearance of 530 mm. It has one reverse and 5 forward gears, and develops an effective traction power of 3,100 kg. in bottom gear.

[1170]. 32.91.12 : 07.7 (470). ORLOV, S. F., and NOSOV, A. I. K voprosu vnedreniya v lesnuyu promȳshlennost' parovoy transportnoy mashinȳ. **[The question of the introduction into the forest industry of a steam tractor.]** *Lesnaya Prom.* 1948 (4), (15–8). [Russ.] [Lesotekhnicheskaya Akademiya im. S. M. Kirova.]

Details of the design of and laboratory tests on an experimental steam-driven wood-burning tractor.

[1171]. 32.91.22 : 07.7. **A truck that yards, loads and hauls** [16-foot logs.] *Timberman* 49 (10), 1948 (113).

[1172]. 32.91.3 : 07.7. SILVERSIDES, C. R. **Portable chutes in pulpwood logging.** *Woodl. Res. Index Pulp Pap. Res. Inst. Canada* No. 39 (B–8–h), 1948. pp. 12. 13 refs. Also in *Pulp Paper Mag. Can.* 49 (8), 1948 (108–24).

An illustrated review of different types of portable pulpwood chute and their performance. Light, sectional, metal chutes, with a shallow, V-shaped cross-section are often more efficient than permanent chutes or horse skidding. For semi-permanent chutes, steel sections are recommended, for movable chutes and skidding small quantities of wood, aluminium. The use of proper connectors is important in saving wear from wires pulling through the metal. [Cf. *For. Abstr.* 5 (40) and 8 (No. 1150).]

[1173]. 32.92–4 : 07.7. POPOV, A. I. Prodol'nȳe naplavnȳe transporterȳ pri toplyakopodemnȳkh rabotakh. **[Floating log conveyors in the salvage of sunken timber.]** *Lesnaya Prom.* 1948 (3), (18–21). [Russ.]

Gives details of an electrically operated endless-chain conveyor for bringing salvaged logs to land, with diagrams showing two of the possible lay-outs for such operations. The chain conveyor consists of two independently driven portions—(1) a log hoist on the bank, and (2) a floating portion sectionally constructed so that its length can be varied according to width of the stream, etc.

The capacity of the conveyor is 445–800 stacked cu.m./[8-hour?] shift. It can be used in conjunction with manual or mechanical methods of raising sunken logs and, if desired, the log hoist can be used without the floating portion. Methods of working are discussed.

[1174]. 32.93.1 : 33.02 (713). GRAY, D. W. **Towing pulpwood on Lake Agnew.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 978 (B–9–h), 1948. pp. 6.

A supplement to a previous bulletin [see *For. Abstr.* 8 (No. 2484)], bringing up to date the information on operating times and costs.

[1175]. 32.94 (711). MCDEVITT, C. **Logging and towing, the Siamese twins of**

coastal B.C. industry. *B.C. Lumberm.* 32 (5), 1948 (93, 97).

A popular account of the methods of constructing and towing sea-going timber rafts on the coast of British Columbia, with particular reference to the dangers inherent in towing rafts at sea.

[1176]. 32.94 (711). **B.C. operator designs improved raft for deep sea towing.** *B.C. Lumberm.* 32 (7), 1948 (57–9).

An illustrated description of the Gibson raft, designed and patented by J. G. Gibson of Gibson Bros., Ltd., Vancouver. Developed for deep sea towing, after the manner of the familiar Davis raft, it differs in several points, chief of which is the use of a separate mat in 2 sections. After the raft has been built up, the mat is cast adrift and can be used again at the booming ground. The rafts described contain between 500,000 and 750,000 bd. ft., but they can be built up to any required size. The strength of the raft in withstanding rough seas depends entirely on the size of the wires used and the tightness of the binding.

[1177]. 32.96 : 07.7. **Modern log unloader.** *W. Cst. Lumberm.* 75 (5), 1948 (61, 108–9).

Description of a log unloader used by the Gardiner Lumber Co., Scottsburg, Oregon. A-frame logs 96 ft. long with 25-in. tops are set 30 ft. apart, and at an angle of about 58°, on log rests of reinforced concrete. A specially constructed, alloy chain is used to suspend 2 lifting bunks, which enter under the load, are pulled into position by the haulback, and connect with a strap and ring to secure the load. When the haulback is slackened the suspended logs swing out over the water and are gently lowered. As the logs flatten out they crowd the rings of the bunk and release themselves. The unloader lifts entire loads (up to 100 tons) straight from truck to the water, eliminates breakages and accumulations of bark and dirt at the log dump, and also leaves the logs side by side in the water, ready for rafting.

[1178]. 32.96 : 07.7. WAHLSTEEN, H. Fagrells lastningsdon: apparat för styckevis lastning av rundvirke på lastbil med släpvagn. **[Fagrell's loader: apparatus for loading round timber, one log at a time, on to a truck and trailer.]** *Skogen* 35 (9), 1948 (106). [Sw.]

Describes, with two photographs, portable and readily dismantled equipment for loading logs on to a truck-drawn trailer. An upright tubular spar, pointed at its lower end, passes through and is locked in a sleeve which takes the lateral thrust via a tubular arm to a movable sleeve-mounting on the longitudinal (horizontal) pole of the trailer. The spar can be set up at any desired point along the length of the trailer. To strengthen the trailer pole against the thrust of the arm and to stabilize the trailer against sideslips during loading, an oblique strut is provided between the ground and the mounting on the pole. The top of the spar carries lugs and rings at various suitable heights, to which a pulley block can be attached. Loading is done by a single cable and a winch driven by the truck motor, the logs being dragged into position up an incline formed by two poles leant against the vehicle.

The apparatus can be set up in about a minute and occupies very little space on the road. When dismantled it packs on to the truck. Its weight (minus the pole mounting, cable and winch) is about 25 kg. A patent has been applied for and G. Nordahls Mek. Verkstad, Sollerö, is to take up production of the apparatus, trials of which have been very satisfactory.

[1179]. 32.96 : 07.7 : 33.02. JONES, A. M. **Loader for transferring pulpwood from team sleighs to trucks.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 979 (B–10), 1948. p. 1.

33. CONVERSION AND PRESERVATION OF WOOD

[1180]. 33 (79) : 94.5. SCHRADER, O. H. **Integrated forest utilization in the Pacific Northwest.** *Mech. Engng., N.Y.* 69 (12), 1947 (999–1004). 7 refs. D.S.I.R.

Describes utilization units operated by the Weyerhauser Timber Company (sawmills, a planing mill, a Pres-to-Log plant, a sulphite pulp mill and a bark-processing plant, with a plywood mill and a sulphate pulp mill under construction) and considers the relationship of the individual units in the use of raw material and recovery of by-products.

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

See also *For. Abstr.* 10 (No. 1148).

[1181]. 33.1 : 07.7. GLENISTER, S. H. **Woodcutting machine work.** George Allen & Unwin, Ltd., London. 1948. pp. 104. *New Builders' Handbook* No. 7. P.R.

Contains chapters on: the circular saw; the planing machine; the band saw; the spindle moulding machine; the mortising machine; and the tenoning machine.

Use of Wastes

See also *For. Abstr.* 10 (Nos. 1161, 1235, 1260, 1318).

[1182]. 33.1 : 34.6 : 33.32.3 : 33.33 : 33.37–8 : 33.7. VORREITER, L. Die Holzabfallverwertung—ein brennendes Problem unserer Holzwirtschaft. **[Wood waste utilization—a burning problem of our timber industry.]** *Repr.* from *Sägewerk und Holzwirtschaft* 1948 (6), pp. 8. [G.] P.R.

A survey of the use of wood waste in Austria for the manufacture of small sawn goods, fibre boards of different kinds, wood-flour, coarse textile fibres and charcoal, in the distillation industries and as fuel.

[1183]. 33.1 : 34.6 : 07.7 : 33.38.2 : 33.7. MYERS, A. F. **Wood waste utilization for heat and generation.** *J. Instn. Heat. Vent. Engrs.* 15 (150), 1948 (417–43). D.S.I.R.

A survey of various types of wood-burning plants, including a gas-producer plant, furnaces for green and dry timber and sawdust, electricity generators, and chip-stokers fitted to various types of boiler; with discussion of figures for the waste production in sawmills and factories, problems of storage, purchase and transport of wood waste, and its combustion and heating values.

[1184]. 33.1 : 34.6 : 33.7. **Stoker fuel popular.** *Timberman* 49 (10), 1948 (78, 80).

A description of the stoker-fuel manufacturing machine in use at the Spokane Pres-to-log Co. Unlike the larger Pres-to-log briquettes, the stoker briquette is produced on a horizontal press, which forces 8 pressed fuel rods through a series of holes. As the pressed material emerges, a rotating knife cuts the rods into pieces the size of nut coal. [Cf. *For. Abstr.* 9 (Nos. 2330 and 2332).]

33.12. Joinery, Turnery

[1185]. 33.12 : 33.15 : 33.17 : 33.4 : 07.7 : 01.2. GREENHALGH, R. [Editor]. **Joinery and carpentry.** Vols. 1–6. 1948. pp. 287; 257; 227; 263; 327; 316. Price 10*s.* each. Sir Isaac Pitman & Sons, Ltd., London. P.R.

A six-volume work consisting of sections by different authors on: (Vol. 1) the selection and use of tools; the workshop and its equipment, joints, fastenings and fixings; machine woodworking; (Vol. 2) doors, frames, and panelling; geometry; windows; (Vol. 3) timber, stairs and handrails; floors; partitions; (Vol. 4) roofs; house fitments; church fittings; circular work and setting out; the carpenter's steel square; (Vol. 5) technical drawing; veneering; timber-framed buildings; calculations; design and ornament; shop fronts and fittings; (Vol. 6) ship joinery; temporary work; mechanics; bank and office fittings; administration of a joinery business; farmwork; and glossary. There are numerous illustrations.

[1186]. 33.12 : 33.3 : 07.7. HOWES, D. E., and HOWES, D. E., JR. **Chemical and mechanical aids in wood bending.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 18, 1947 (81–95). L.S.

A study of softening agents and methods in wood bending showed that the use of urea for softening gives no marked advantages. The authors assert that more attention should be paid to mechanical factors, such as forms and bending aids.

33.13. Cooperage. Shingles

[1187]. 33.13 : 31.27. KURTENACKER, R. S., and PATRICK, D. L. **Performance characteristics of tight white-Oak laminated-stave and solid-stave barrels.** *Trans. Amer. Soc. mech. Engrs.* 70 (5), 1948 (547–51). P.R.

Under compression, drop, and internal hydrostatic-pressure tests, barrels manufactured with laminated staves and plywood heads gave better performance except in the diagonal drop test on the chime, where the solid-stave barrel suffered less damage.

[1188]. 33.13 : 33.15.2. ROBINS, C. H. **Wooden barrel staves.** *Brit. Patent* No.

593,952, Sept. 29, 1947. *Abstr.* in *Timber News* 56 (2107), 1948 (199).

Describes a laminated-wood barrel stave with greater strength and less liability to split than ordinary staves. The grain of the outermost laminae runs parallel to the longitudinal medial line of the stave, and the grain of intermediate layers runs obliquely to it alternately in opposite directions so that the grains of adjoining laminae cross diagonally. The outermost lamination may be of a hardwood resistant to wear, the innermost may be of any wood suitable to the contents of the barrel, and intermediate laminations of any suitable softwood either untreated or resin-impregnated, or of a fibrous or cellular material other than wood.

[1189]. 33.13 : 33.34 : 33.36.1. BROWNE, F. L. **The preservative treatment and staining of shingles.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*761 (rev.), 1947. pp. 9. P.R.

33.15. Manufacture and Use of Veneers and Laminated Wood. Improved Woods. Laminated Materials other than Wood. Glues and Gluing

See also *For. Abstr.* 10 (No. 1185).

[1190]. 33.15. VOSS, W. C. **Engineering laminates: fundamentals underlying the problems of their inhomogeneity.** *Proc. Amer. Soc. Test. Mater.* 47, 1947 (449–82). 5 refs. P.R.

Discusses the theory of the structure of the atom and of crystalline structures and the theories of chemical and mechanical adhesion to illustrate the structural complexity of laminate materials. Describes apparatus and method evolved for testing the suitability of plywood for use in Mosquito aircraft.

[1191]. 33.15 : 33.32.3 : 31.22.2. MILLETT, M. A., and HOHF, J. P. **Dimensional stability of synthetic board materials used as core stock.** *Prepr. U.S. For. Prod. Res. Soc.* No. 34, 1948. pp. 9. P.R.

Preliminary studies were made at Madison of the dimensional stability of veneer- or plywood-faced panels with a core-stock of fibrous wood-waste board materials. The variables studied included fibre size, ratio of fibre to binder, core-stock density, drying-oil treatment, and face and core construction. In the ranges studied, neither fibre size nor ratio of fibre to binder had any noticeable effect on the stability of the core stock. From the standpoint of dimensional stability the most suitable density ranged between 0·4 and 0·7 g./c.c. Drying-oil treatment increased the bending strength of fibrous core materials and greatly reduced the extent of springback on recovery after water immersion. It had little effect on swelling equilibrium but did retard the rate of swelling. Single veneer sheets were not suitable face materials. Faces should be of 2- or 3-ply cross-banded construction, applied to both sides of the core. Edge-grain core-stock panels exhibited lower swelling and springback values than flat-grain panels. To prevent excessive sidewise swelling of edge-grain cores, the core strips should not be tightly packed during panel assembly. All core materials reached a maximum recovery value after exposure to moisture and then exhibited a relatively constant degree of swelling under given conditions of humidity. Pre-conditioning at high relative humidities would therefore eliminate differential swelling in a core combined of fibrous and normal wood. *From authors' summary.*

33.15.1. *Manufacture of Veneers and Laminated Wood*

See also *For. Abstr.* 10 (Nos. 1324, 1378).

[1192]. 33.15.1 (431–5) : 33.8 : 33.52. SEBORG, R. M., and FLEISCHER, H. O. **Production and fabrication of glued wood products in Western Germany.** *FIAT Final Rep. Brit. Intell. Obj. Sub-comm.* No. 366, 1945. pp. 62 + 2 photos. P.R.

Discusses methods of production and properties of German aircraft plywood and aircraft glues, the fabrication of aircraft moulded parts and the gluing of railway ties and timbers. [Cf. *For. Abstr.* 9 (pp. 392–3).]

[1193]. 33.15.1 (728) : 35 : 31.0. **Veneer and plywood industry in Mexico.** *Sth. Lumberm.* 176 (2212), 1948 (86, 88).

Mexico's plywood industry in 1946 consisted of 3 main plants, 2 in Yucatan and one in the state of Mexico, and several smaller mills making veneer for baskets and crates. Estimated plywood production in 1946 was

31,216,000 sq. ft. and consisted mainly of grades suitable for the cheaper types of furniture, building construction, boats and other similar products. *Cedrela odorata* is the most important timber used, with some Mahogany (*Swietenia*, spp.) and other tropical woods. Before the war Mexico imported annually nearly 2,000,000 kg. of plywood and more than 50,000 kg. of veneer. Since 1942 imports have declined, partly because of shortages and partly to encourage the domestic industry. In 1946 Mexico itself exported 884,271 kg. of plywood. A list of 11 Mexico timbers is given, with notes on their properties.

[1194]. 33.15.1 (81). **Brazilian plywood.** *Wood* 13 (6), 1948 (176–7).

Over 90% of the plywood made in Brazil (which amounts to 2,000,000 cu. ft.) is made from *Araucaria angustifolia*. Some for local use is made of *Cedrela fissilis*, which is highly resistant to insect attack. Other species used are *Paratecoma* sp., *Cariniana legalis*, *Phoebe porosa*, and *Dalbergia nigra*.

[1195]. 33.15.1 : 33.36.3 : 12.25. ALEXANDER, C., and WATSON, A. J. **Joint report on V.G.5–42–Y–1, V.G.5–43–Y–1, V.G.7–42–Y–1, V.G.7–43–Y–1. Peeling and drying of veneer from plantation-grown Loblolly Pine and Slash Pine.** Div. For. Prod., Coun. sci. industr. Res., Aust. 1947. pp. 4.

The peeling properties of Loblolly Pine (*Pinus taeda*) and Slash Pine (*P. caribaea*), and the drying characteristics of the veneer from these species are described. No difficulties were encountered in either peeling or drying operations and both species appeared to be suitable for the commercial production of veneer. The investigation was, however, confined to trees of small diameter. *Authors' summary.*

[1196]. 33.15.1 : 01.4. FLEISCHER, H. O. **Heating veneer logs.** *Repr.* from *Wood, Chicago*, March, 1948. pp. 4. 2 refs. [Forest Products Laboratory, Madison.] P.R.

Gives heating schedules, based on experiments carried out at Madison, for obtaining optimum conditions for peeling veneer logs of White Oak [*Quercus alba*], Yellow Birch [*Betula lutea*], Sweetgum [*Liquidambar styraciflua*] and Yellow Poplar [*Liriodendron tulipifera*]. The figures given show the temperature to be reached by the heating medium (steam or water), the temperature to be attained by a bolt of 8 in. diameter, and the approximate time required, when heating in water or steam, to reach the optimum temperature for bolts of 12, 24 and 36 in. diameter over bark.

[1197]. 33.15.1 : 12.26–8 : 33.6. GARLAND, H. **Aspen for veneer.** *Lake St. Aspen Rep.* No. 13, 1948. pp. 10. 14 refs.

The uniform structure of Aspen (*Populus tremuloides*), its low density, resistance to splitting, light colour and lack of odour, make it suitable for certain kinds of veneer, particularly container veneer. Its restricted use in this industry is partly due to the fact that industries lack the equipment to cut small logs. Some recommendations are made for rotary cutting and slicing small logs and for manufacturing large sheets of veneer from narrow strips.

[1198]. 33.15.1 : 07.7. PERRY, T. D. **Cauls in plywood manufacturing.** *Wood Prod.* 53 (8), 1948 (39–40, 42–5).

A brief survey of types of caul and methods of use.

33.15.2. *Use, Strength and Durability of Plywood and Other Laminated Wood*

See also *For. Abstr.* 10 (Nos. 1187–8, 1272, 1314, 1324, 1378).

[1199]. 33.15.2 : 33.32.3 : 31.27. ELMENDORF, A. **Basic tests for plywood.** *Sth. Lumberm.* 177 (2216), 1948 (74, 76, 78).

[1200]. 33.15.2 : 31.27. Résistances mécaniques des contreplaqués. [**The mechanical strength of plywood.**] *Rev. Bois Appl.* 3 (5), 1948 (28, 31). [F.]

Discusses, with graphs, the effect on the strength of plywood of the strength of the species used, the arrangement and thickness of the plies and the type of glue.

[1201]. 33.15.2 : 12.25 : 31.22.1 : 31.27. KINGSTON, R. S. T. **The variation of maximum crushing strength, maximum tensile strength, and modulus of elasticity of Hoop Pine (*Araucaria cunninghamii*) plywood with moisture content.** *J. Coun. sci. industr. Res. Aust.* 20 (4), 1947 (538–52). 14 refs. O.R.H.

Hoop Pine plywood $\frac{1}{8}$, $\frac{3}{16}$ and $\frac{1}{4}$ in. thick, bonded with phenol-formaldehyde, urea-formaldehyde and casein glues, was tested in

compression and tension, parallel, perpendicular and at an angle of 45° to the grain. The elastic modulus was also determined from the tensile tests. The tests were carried out at nominal moisture contents of 8, 12, 16 and 20% and regression factors were determined so that moisture corrections could be made to the corresponding strength figures. Tables are included giving the strengths at each integral percentage of moisture content over the range of observations, expressed as a percentage of the corresponding value at 12% moisture content. *From author's summary.*

[1202]. 33.15.2 : 31.27. KUENZI, E. W., and NORRIS, C. B. **Longitudinally stiffened thin-walled plywood cylinders in axial compression.** *Rep. U.S. For. Prod. Lab., Madison* No. 1562, 1948. pp. 11 + 4 photos, 13 gphs., 2 tbls. P.R.

[1203]. 33.15.2 : 31.27. WERREN, F., and NORRIS, C. B. **Effect of axial stiffeners on the buckling properties of thin curved plywood plates in axial compression.** *Rep. U.S. For. Prod. Lab., Madison* No. 1567, 1948. pp. 7 + 1 photo, 1 dgm., 4 gphs., 1 tbl. 5 refs. P.R.

[1204]. 33.15.2 : 31.27. NORRIS, C. B., KOMMERS, W. J., and MCKINNON, P. F. **Critical buckling strength of stiffened flat plywood plates in compression and shear—closely spaced stiffeners.** *Rep. U.S. For. Prod. Lab., Madison* No. 1800, 1948. pp. 18 + 4 photos, 3 dgms., 9 gphs., 3 tbls. P.R.

[1205]. 33.15.2 : 33.8 : 33.15.5. BEAULIEU, L. A. **The weathering of moulded plywood components.** *Aircr. Engng.* 20 (232), 1948 (171–5, 186). P.R.

Representative moulded plywood aircraft parts were exposed to weathering over a period of 5½ years and inspected periodically. Most of the parts were made of laminated Birch and laminated Sitka Spruce. It appears from the results of the tests that: laminated articles exhibit good dimensional stability; the weight may change rapidly; end-grain protection to hinder moisture penetration is important; stresses due to variable moisture content, grain direction, and thickness of laminations have a direct bearing on the life of the laminate under weathering; a protective coating is more necessary for the wood than for the adhesive; the life of the cold-setting urea-formaldehyde glue tested is 6 months or less, while other synthetic resins will last for years, or probably as long as the wood.

33.15.3. *Improved Woods*

See also *For. Abstr.* 10 (Nos. 1219, 1314).

[1206]. 33.15.3. **What's new with 'improved' wood. A brief review of the various developments with references to reports for specific detail compiled by the Forest Products Laboratories of the Dominion Forest Service.** *Timber of Canada* 8 (6; 7), 1948 (39, 98, 100–4, 107–8; 90–91). 58 refs.

[1207]. 33.15.3. ARIES, R. S., and MALARY, R. **Impregnation of wood with terpin hydrate.** *Bull. Ntheast. Wood Utiliz. Coun.* No. 18, 1947 (97–103). L.S.

Tests were made of wood impregnation with, (1) molten terpin hydrate, (2) molten terpin hydrate and a plasticizer, (3) various solvents. Data on dimensional stability after treatment are tabulated. For dimensional stability, the best solvent was furfuryl alcohol, the best plasticizer, glycerol. In hardness tests butyl 'Carbitol' acetate proved the best plasticizer.

[1208]. 33.15.3 : 33.8. GOODALE, R. B. **Compregnated wood tested by navy.** *Mod. Plastics* 25 (6), 1948 (102–5). P.R.

Details briefly the construction and installation of experimental compreg decking on aircraft carriers. The planking, which was designed and produced by the American Plywood Co., consists of a wearing surface of ⅜-in. compreg, a 1-in.-thick normal Redwood core, ⅛-in. compreg and finally a ½-in. normal Redwood board. Service reports indicate that the new decking is superior to many other experimental types but inferior to Teak in wearing qualities, and heavy or concentrated loads will cause surface impressions in the compreg. Ship decking specifications, however, are now in preparation at the U.S. Bureau of Ships.

[1209]. 33.15.3 : 33.8. **'Hydulignum'—a high duty compressed wood.** *Textile Manufacturer* 74 (879), 1948 (112–3). L.S.

It is considered that the strength, elasticity and durability of Hydulignum make it particularly suitable for the textile industry where it is already giving good service for picking sticks, shuttles, underlevers and race boards.

33.15.4. *Laminated Materials other than Wood*

See also *For. Abstr.* 10 (No. 1325).

[1210]. 33.15.4 : 33.15.5. MEAKIN, K. S. **Bonding wood to metal.** *Timber News* 56 (2107), 1948 (169–70). 6 refs. [Aero Research Ltd., Duxford, Cambridge.]

[1211]. 33.15.4 : 33.15.5. PERRY, T. D. **Plymetal problems.** *Wood Prod.* 53 (6), 1948 (39–40, 42–4).

Includes a table giving examples of the increase in stiffness for single- and double-faced plymetal as contrasted with solid metal, and notes on glues and gluing in the production of metal-faced plywood.

[1212]. 33.15.4 : 33.15.5. MOSS, C. J. **Plastic bending for composite wood and metal structures.** *Plastics* 12 (133), 1948 (304–11). 7 refs. P.R.

[1213]. 33.15.4 : 33.8 : 33.4 : 33.6. NICHOLS, W. **Reinforced plywood.** *Timber and Plywood Annual* 1947–8 (152, 154, 156, 158). P.R.

Plywood is reinforced with a core material consisting of fine gauge H.T. wires interwoven with cotton fabric. The product has great flexibility and increased strength. It has been found suitable for bodywork construction of public transport vehicles, for flooring panels in houses and vehicles, and in conjunction with timber framework for packing cases and containers.

[1214]. 33.15.4 : 31.27. BOLLER, K. H. **Buckling loads of flat sandwich panels in compression. B. Buckling of flat sandwich panels with loaded edges simply supported and the remaining edges clamped. C. Buckling of flat sandwich panels with loaded edges clamped and the remaining edges simply supported. D. Buckling of flat sandwich panels with all edges clamped (cores of end-grain Balsa or cellular cellulose acetate and faces of aluminum or glass cloth laminate).** *Rep. U.S. For. Prod. Lab., Madison* Nos. 1525 B, 1947, pp. 12 + 4 tbls. + 5 plates + 4 gphs.; 1525 C, 1947, pp. 6 + 4 tbls. + 2 plates + 2 gphs.; 1525 D, 1947, pp. 6 + 4 tbls. + 1 plate + 4 gphs. P.R.

Describe experiments confirming theoretical formulae advanced to determine the critical buckling loads for the different edge-clamping conditions.

[1215]. 33.15.4 : 31.27. BOLLER, K. H. **Preliminary report on the strength of flat sandwich plates in edgewise compression.** *Rep. U.S. For. Prod. Lab., Madison* No. 1561, 1947. pp. 12 + 2 photos, 5 dgms., 2 gphs., 7 tbls. P.R.

[1216]. 33.15.4 : 31.27 : 33.8. WERREN, F **Fatigue of sandwich constructions for aircraft. (Aluminum face and end-grain Balsa core sandwich material tested in shear.)** *Rep. U.S. For. Prod. Lab., Madison* No. 1559–B, 1948. pp. 6 + 3 photos, 2 dgms., 1 gph., 1 tbl. 1 ref. P.R.

[1217]. 33.15.4 : 31.27. MARCH, H. W. **Effects of shear deformation in the core of a flat rectangular sandwich plate. (1) Buckling under compressive end load. (2) Deflection under uniform transverse load.** *Rep. U.S. For. Prod. Lab., Madison* No. 1583, 1948. pp. 29 + 3 dgms. 5 refs. P.R.

[1218]. 33.15.4 : 31.46 : 38.2. **Physical properties and fabrication details of experimental honeycomb-core sandwich house panels.** *Technical Paper, Housing and Home Finance Agency, Washington, D.C.* No. 7, 1948. pp. 25. P.R.

Describes the construction of a test unit of sandwich panels with different facings, including plywood and veneers, erected at Madison for long-term weathering tests. No attempt is made, as yet, to evaluate the performance of the various sandwich panel constructions. As the design details of the unit necessarily differ from those used in house construction, a suggested plan for a 4-room house of sandwich panels is included.

33.15.5. *Glues and Gluing*

See also *For. Abstr.* 10 (Nos. 1210–2, 1291–3).

[1219]. 33.15.5 : 33.15.3. GRANHOLM, H., and SARETOK, V. Lim och limning. **[Glues and gluing.]** *Handlingar, Chalmers teknisk Högskola* No. 62, 1947. pp. 73. 56 refs. [Sw.e.] P.R.

Discusses the history and theory of gluing, methods of testing, methods and glues for

gluing wood to wood and wood to metal, and the use of synthetic resins in the manufacture of improved wood.

[1220]. 33.15.5. NARAYANAMURTI, D., and DAGG, G. D. **Studies on adhesives. Part X. Adhesives from castor seed cake and its proteins.** *Indian For. Leafl.* No. 100, 1947. pp. 8.

Results from tests of plywood, glued with adhesives from castor-seed-cake proteins, are presented. They indicate that the adhesives are suitable for commercial plywood, but are not as good as those from groundnut proteins.

[1221]. 33.15.5. SAWYER, F. G., HODGINS, T. S., and ZELLER, J. H. **Phenolic resin glues for plywood.** *Industr. Engng. Chem.* 40 (6), 1948 (1011–8). P.R.

[1222]. 33.15.5 : 07.2. LIRON, R. Essais des colles à bois. [**Tests of wood glues.**] *Rev. Bois Appl.* 2 (12), 1947 (20–3); 3 (2), 1948 (10–12). [F.] P.R.

[1223]. 33.15.5 : 07.2 : 01.4. RUDKIN, A. W. **A simple method of testing glue lines in tension.** *J. Coun. sci. industr. Res Aust.* 20 (4), 1947 (527–37). 5 refs. O.R.H.

Cross-shaped test specimens made of 2 slips of wood, and with a glue-line area of exactly 1 in. square, are held by a specially designed shackle which can be fitted to a standard testing machine of the kind used in shear-strength tests. When the load is applied to the shackle in the usual way it is transmitted to the test specimen in a direction perpendicular to that of the glue line, and the tensile failing load can be read off in the same way as shear failing loads. It is estimated that this method of testing the tensile strengths of glue joints is as accurate as the accepted standard tests on shear strengths.

[1224]. 33.15.5 : 01.4. **New plywood process.** *Sth. Lumberm.* 177 (2216), 1948 (80).

A revolutionary process of gluing plywood without clamps has been patented by the Monsanto Chemical Co. (U.S. Patent No. 2,402,492). Standard low-cost adhesives and a standard cold press are used. Plywood veneer and cores are assembled in loads in the same way as in the regular cold-press method (maximum assembly time 25 min.) and the loads are allowed to stand 5 min. before pressing for 15 min. It is claimed that a great amount of labour is saved by the elimination of clamping and unclamping processes and that the method gives straight panels, free from wavy surfaces.

[1225]. 33.15.5 : 07.7. MARRA, A. A. **The technology of the glue line in electronic edge-gluing of lumber.** *Sth. Lumberm.* 176 (2212), 1948 (77–8, 80, 82–3).

[1226]. 33.15.5 : 07.7. MOSER, H. C. **Edge-gluing engineering and production systems.** *Wood. Prod.* 53 (6), 1948 (22, 24, 26).

Emphasizes the importance of careful organization of production for the economical use of dielectric glues for edge-gluing, and describes such organization in one plant.

[1227]. 33.15.5 : 38.2. [GIESE, H.] **The utilization of lumber in farm building construction.** *Rep. Ia. agric. Exp. Sta.* 1947 (44).

Some investigations were made of the effectiveness of glued joints, especially with rough lumber. Glued joints using rough lumber are slightly more than half as strong as similar joints with surfaced lumber. Either casein or resorcinol-resin glue may be used for this purpose. From 2 to 3 times the quantity of glue is required for rough lumber.

33.16. Wood-wool (Excelsior) Manufacture

[1228]. 33.16 (73). MORBECK, G. C. **Excelsior manufacture.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1711, 1948. pp. 3.

A brief survey of the uses and properties of wood wool, its manufacture, grading and marketing in the U.S.A.

33.17. Sawmilling

See also *For. Abstr.* 10 (No. 1185).

[1229]. 33.17 (672.1) : 33.52. NOYON, F. Une scierie au Gabon. [**A sawmill in Gabon.**] *Bois For. Trop.* No. 6, 1948 (167–74). [F.]

Account of a large sawmill specializing in the production of sleepers from tropical timbers.

[1230]. 33.17 : 07.7 : 33.06. SYME, P. S. **A portable tractor saw bench.** *N.Z. J. Agric.* 76 (1), 1948 (92). O.R.E.

Describes a small tractor-driven saw for firewood. It is 20 in. in diameter, driven by a 4½-in. pulley, connected by a crossed drive belt

to a 15-in. pulley on the tractor. The saw speed is about 1,500 revs./min.

[1231]. 33.17 : 07.7 : 01.1 (489). HUNDAHL, R. Rammesave. **[Frame saws [: a review of literature on factors affecting their mechanical efficiency].]** *Dansk Skovforen. Tidsskr.* 33 (4), 1948 (121–49). 35 refs. [Dan.]

At the request of the timber industries, the Danish Academy of Technical Sciences has appointed a Committee on Woodworking to study the possibilities of obtaining useful practical results from systematic research on problems such as the energy consumption of woodworking machinery. The present paper, prepared in connexion with these studies, is a review of existing information—largely from German sources—on factors governing the mechanical efficiency of frame saws, with chief reference to types of blade and teeth, and rate of feed.

[1232]. 33.17 : 31.28 : 12.25–9 : 01.3. **The 'London' sawmilling classification of timbers.** London and District Sawmiller Owners Association. 1948. pp. 36. P.R.

Tables showing the sawmilling classification, commercial and botanical name, and country of origin of hardwoods and softwoods.

[1233]. 33.17 : 53.43.2. HERRICK, A. M. **Accuracy in estimating over-run.** *Sth. Lumberm.* 177 (2215), 1948 (57–8). 1 ref.

The author illustrates by comparative graphs and tables the fact that over-run can be more accurately calculated when measured in bd. ft. than when measured as a percentage of the total log volume.

[1234]. 33.17 : 52.1 : 76.1. **Sawing costs studied.** *Sth. Lumberm.* 176 (2213), 1948 (78).

Presents the results of a study made by the Appalachian Hardwood Manufacturers, Inc., on an 8-ft. band mill. An hour's cutting of logs 13 in. and less in diameter gave $242.10 worth of timber, whereas logs 14 in. and over gave $445.60 worth. The same amount of labour was involved in both cases.

33.3. *Chemical Treatment*

Use of Wastes

See also *For. Abstr.* 10 (Nos. 1125–26, 1302).

[1235]. 33.3 : 34.6 : 33.1 : 34.24. FREIDAY, J. H. **Bark burning methods.** *Combustion* 19 (4), 1947 (45–6). L.S.

Describes the process of combustion of bark in a Dutch oven or furnace and the effects of different methods of feeding, and makes some suggestions for improvements.

[1236]. 33.3 : 34.6 : 31.3. PENISTON, Q. P., and MCCARTHY, J. L. **Lignin. I. Purification of lignin sulfonic acids by continuous dialysis.** *J. Amer. chem. Soc.* 70 (4), 1948 (1324–8). 20 refs. O.R.S.

[1237]. 34.6 : 33.3 : 31.3. PENISTON, Q. P., and MCCARTHY, J. L. **Lignin. II. Liberation of phenolic hydroxyl groups by alkaline cleavage of lignin sulfonic acids.** *J. Amer. chem. Soc.* 70 (4), 1948 (1329–32). O.R.S.

[1238]. 33.3 : 34.6 : 11.47.12. SOWDEN, F. J., and ATKINSON, H. J. **Waste sulphite liquor solids as a soil treatment.** *Sci. Agric.* 28 (4), 1948 (175–82). 9 refs. O.R.E.

Various greenhouse soil treatments, using waste sulphite liquor products, were investigated by the Division of Chemistry, Science Service, Central Experimental Farm, Ottawa. Three materials were investigated:—(1) prepared from an ammonium-base cooking liquor neutralized with ammonia and containing 3·8% N, (2) from a calcium-base cooking liquor neutralized with ammonia, containing 2·4% N, (3) from a calcium-base cooking liquor, neutralized with $Ca(OH)_2$, containing less than 0·1% N. All samples contained 7–8% S. On soils where oats responded to applications of N, response to additions of waste sulphite liquor solids containing N was also obtained. The nitrogen of (1) was appreciably more available to the plants than that of (2). The treatments had little or no effect on the growth of alfalfa, and sulphur, whether applied as gypsum or with the waste-sulphite-liquor solids, had no beneficial effect on the growth of either oats or alfalfa. A chemical examination of the materials showed that the ammonia nitrogen and the nitrogen obtained after refluxing with alkaline potassium-permanganate solution were considerably less in (2) than in (1). *From authors' summary.*

[1239]. 33.3 : 34.6 : 01.2. **Standard terms relating to tall oil.** *Paper Tr. J.* 126 (21), 1948 (54). P.R.

[1240]. 33.3 : 34.6 : 07.2 : 01.4. KAHILA, S. K. **Mäntyöljyn analyysimenetelmistä.**

[Methods of analysis for tall oil.] *Papp. Trävarutidskr. Finl.* 30 (9; 10; 11), 1948 (144–6; 164, 171–4; 198–202). 21 refs. [Fi.e.] P.R.

[1241]. 33.3 : 34.6. LEWIS, H. F. **A review of byproducts of sulphite pulping.** *Paper Tr. J.* 127 (2), 1948 (51–5). 21 refs. P.R.

33.32. Pulp and Paper Manufacture. Wallboards. Plastics.

See also *For. Abstr.* 10 (Nos. 928, 1018–20, 1110, 1236–41).

[1242]. 33.32 (52). COHEN, W. E. **Pulp and paper in Japan.** *Proceedings, Australian Pulp & Paper Industry Technical Association* 1, 1947 (49–62). P.R.
Cf. *For. Abstr.* 9 (No. 404).

[1243]. 33.32 (71) : 06.1. **Canadian Pulp and Paper Association: Summary of organization and functions.** Canadian Pulp and Paper Association, Montreal. 1948. [pp. 5.]

[1244]. 33.32 (711). **Historical notes on British Columbia's pulp and paper industry [with map giving sites of pulp and paper mills].** *Pulp Paper Mag. Can.* 49 (8), 1948 (67–8).

[1245]. 33.32 : 34.27. HVIDSTEN, H. Erfaringer med trecellulose og luta halm til hester. **[Feeding wood pulp and straw [treated by the Beckmann method] to horses.]** *Meldinger, Norges Landbrukshøgskole* 25 (3/4), 1945 (210–52). 27 refs. [Nor. nor.e.] M.A.F.

Discusses earlier experiments on feeding wood pulp to horses in Norway, Sweden and Denmark, and the results of a few experiments carried out in Norway during 1940, and summarizes the results of a survey carried out on 34 farms using controlled feeding, in southern Norway. Pulp was found to be a useful substitute feed and was largely used during the war. Not more than 5 kg. should be fed daily, the usual allowance being 3–4 kg. (chopped) with 10–12 kg. hay and straw.

[1246]. 33.32 : 31.42.12 : 12.25 : 32.81. BJÖRKMAN, E. Om användningen av rötskadad gran för framställning av pappers- och silkesmassa. **[The use of Norway Spruce infected with decay fungi for paper and rayon pulps.]** *Skogen* 35 (5/6), 1948 (60–1). 1 ref. [Sw.]

Since little is yet known of the effects of early-stage decay on pulp yields and quality, a co-operative investigation has been started by the Swedish College of Forestry, three industrial pulp laboratories, and the Swedish Wood Research Institute, to study the possibilities of using wood infected with *Polyporus annosus*, *Armillaria mellea*, and some hitherto unidentified but common Norrland decay fungi, mixed in various proportions with sound wood. The intention is not to delay the issue of new grading rules for pulpwood but to get at least enough preliminary results for the commonest types of decay, within a few months if possible, for the rules to be placed on a more realistic basis.

[1247]. 33.32 : 12.25 : 45.3 : 31.42.11. **[Pulping tests on insect-killed and green-cut Lodgepole Pine.]** *Rep. Nth. Rocky Mt. For. Range Exp. Sta.* 1947 (22).

About 170 cords each of dead and green Lodgepole Pine were tested by a pulp and paper firm in Wisconsin. Owing to the low moisture content of the dead wood (19·5%) in comparison with the green (41·9%) the chips from the dead wood did not pack as well in the digester and the yield per digester of dead wood fell 23·5%. Losses in other properties were less significant. Similar tests were made at the Forest Products Laboratory on dead Lodgepole Pine and also on rapid- and slow-growing green-cut material. In these tests the loss in yield from the dead wood was smaller (yield 44% of dry weight of wood compared with 47% for green-cut wood). Most significant was the small loss found in the strength properties of the dead wood even when it contained a high percentage of decay. Test material containing as much as 28% of advanced decay still possessed 88% of the bursting, 98% of the tearing, 92% of the tensile and 98% of the folding strength of green-cut material.

[1248]. 33.32 : 12.25 (46) : 57.9 : 22.12 : 24 : 31.0. ECHEVERRÍA, I., and PEDRO, S. DE. El *Pinus pinaster* en Pontevedra, su productibilidad normal y aplicación a la celulosa industrial. **[*Pinus pinaster* in Pontevedra, its normal productivity and its application to the cellulose industry.]** *Bol. Inst. for.*

Invest. Exp. Madrid 19 (38), 1948. pp. 147. [Span.span.f.e.g.]

A detailed study of *Pinus pinaster* in the coastal district of Pontevedra, Galicia, where it shows more rapid growth and greater annual yield per ha. than in the interior. In part I yield tables are presented covering a period of 25 years, based on a series of plots established in Galicia and divided into 5 quality classes according to the standing volume. The significance of these figures for silvicultural practice is discussed. Felling cycles should vary according to site quality. A cycle of 24 years is recommended for Class I sites, 25 years for Class II sites, but it should never be longer than 35 on any site. The proportion of the volume suitable for pulpwood to the total volume realized is greatest in the tree of 22·5 cm. diameter. The tables indicate that thinnings are most effective and profitable when made every 3 years. The interrelationships of the values for height, diameter and density are discussed.

Part II consists of a study of the wood, its density, histological characteristics and chemical properties (cellulose, pentosan, lignin, nitrogen and tannin content). A detailed study has been made of fibre length in tree sections at different heights. Various methods of pulp manufacture are also discussed, with preliminary results of experiments made at the Spanish Forest Research Institute. The sulphate process appears to be the most successful, and can be modified to produce bleachable pulps or stronger non-bleachable pulps.

[1249]. 33.32 : 12.26–8. MARPILLERO, P. Realizzazioni chemiurgiche italiane: lo 'Xylon' e l' 'Abikraft'. **[Italian chemical achievements: 'Xylon' and 'Abikraft'.]** *Chimica* 2 (3/4), 1947 (77–80). [It.] P.O.

The Italian chemical industry has developed a process for manufacturing fibreboard from hardwoods and agricultural wastes by a process of semi-hydrolysis sufficient to remove only the hemicelluloses. The remaining lignocellulose fibres, which have very much the appearance of ordinary coniferous bisulphite pulp, when subjected to heat and pressure, form a reconstituted material of great strength without the addition of any further substance. It is possible to obtain, for example, from 100 kg. of stripped hemp stalks, 70 kg. of lignocellulose, which will produce the same quantity of fibreboard, and about 20 kg. of pentosans from which can be obtained 6–8 kg. of furfural. A commercial plant near Ferrara is producing by this process more than 1,000 sq. m. of fibreboard daily.

Experiments have also used the lignocellulose thus obtained from agricultural wastes, for papermaking. The yield is nearly double that obtained from the same materials by the usual processes, consumption of steam is much reduced, and consumption of chemicals very small. The strength of the kraft-type pulp (Abikraft) obtained in experiments with stripped hemp stalks, with a yield of 50–55%, was 9,000–10,000 m. breaking length, 8,000–9,000 bending strength, and 4–6.5% tensile strength.

33.32.1. *Pulp Manufacture*

See also *For. Abstr.* 10 (No. 1114).

[1250]. 33.32.1. GRÖNVIK, A. Torkningens inverkan på slipmassans egenskaper. **[The effect of drying on the properties of mechanical pulp.]** *Papp. Trävarutidskr. Finl.* 30 (7/8; 9), 1948 (110–2, 118–9; 150–4). 24 refs. [Sw.e.] P.R.

Experiments showed that danger of mildew was eliminated if pulp was dried to 75%. Strength and other properties are, however, adversely affected by drying, and investigations into the possibility of compensating this deterioration are in progress. Results are expressed in graphs and tables.

[1251]. 33.32.1 : 07.7. MACLAURIN, D. J., and ALLEN, A. M. VAN. **Performance of a whole log chipper and associated equipment.** *B.C. Lumberm.* 32 (7), 1948 (65–8, 129–30). 4 refs.

An account of a 4-bladed, Waterous whole-log chipper used by the Powell River Co., Ltd. The disc, of 123 in. diameter and 10 in. thick, is driven by a 500-h.p., 250-r.p.m. wound-rotor induction motor. The blades are formed by two 16¾-in. knives, which are changed at the beginning of each shift. The chipper handles logs up to 25 in. in diameter and would probably take logs up to 40 ft. in length, though at the Powell River Co. other factors limit them to about 26 ft. Maximum production there is about 45 cords per hour, though, theoretically, with 7-in.-diameter logs, it should be about 62 cords. The chips are screened and the oversize fraction (about 1%) is returned to the screen feed through a 50-in., 4-bladed chipper.

Data on chip quality and screen and re-chipper performance are given. Less acid-susceptible (i.e. compressed or damaged) wood and greater uniformity of chip size are obtained than with the old 84-in.-diameter, 3-knife chipper, though rather more 'fines' are produced. About 6–8% of total log weight, formerly lost in saw-kerf, when cutting 32-in. blocks, is saved by using the whole-log chipper.

[1252]. 33.32.1 : 01.4 : 12.26–8. SOMERVILLE, J. L. **The preparation and properties of chlorine pulp from Eucalypts.** *Proceedings, Australian Pulp & Paper Industry Technical Association* 1, 1947 (74–98). 3 refs. P.R.

The pulps were prepared by defibring chips by the Asplund process, screening, delignifying by repeated chlorination, and bleaching by a hypochlorite treatment; these processes are described in detail. Pulps made in this way from *Eucalyptus regnans, E. obliqua* and *E. gigantea* were strong, dense, wet, and of a high degree of whiteness.

[1253]. 33.32.1 : 12.29. BHARGAVA, M. P., and SINGH, C. **Interim report on the pulping qualities of crushed and uncrushed Bamboo chips.** *Indian For. Bull. (n.s.) Utilization* No. 127, 1942 (1947). pp. [ii] + 13 + 4 plates.

Samples of chips from *Dendrocalamus strictus*, (1) crushed, (2) partially crushed, and (3) uncrushed, were tested for uniformity, bleachability and pulp yield under the same conditions of digestion. The most satisfactory in every way was (1), but from a practical point of view, thorough or even partial crushing of Bamboo stems has the disadvantages that power consumed is high, and size of crushed chips is more irregular and uneven that that of chips obtained by oblique chipping. An ideal method would be to cut the Bamboo into more or less uniform chips and crush the chips, so that the bundle sheaths of the fibro-vascular bundles would be loosened and separated out from the ground tissues and their rigidity reduced, thus giving an easier and quicker penetration of the cooking liquors. It is doubtful, however, whether such a method is practicable.

33.32.2. *Paper Manufacture*

[1254]. 33.32.2 : 12.26–8. MACKIN, G. E. **Book paper from Aspen semichemical and groundwood pulp.** *Rep. U.S. For. Prod. Lab., Madison* No. R1709, 1948. pp. 3 + 2 tbls. 2 refs. P.R.

Experiments at Madison showed that a furnish using 20% Spruce sulphite pulp, 30% Aspen semichemical and 50% free Aspen groundwood pulps produced paper of adequate quality. The Aspen semichemical pulp gave the necessary freeness and when this was combined with a free Aspen groundwood, satisfactory freeness and absorbency in the sheet were obtained.

33.32.3. *Wallboards, Fibreboards, etc.*

See also *For. Abstr.* 10 (Nos. 1182, 1191, 1199).

[1255]. 33.32.3 : 01.4 : 07.7. TEXTOR, C. K. **Wood-fibre production with revolving disk mills.** *Paper Tr. J.* 126 (16), 1948 (47–53). P.R.

A general survey. The principles, design and operation of revolving disk mills and the procedure and equipment for pre-treatment, such as steaming or cooking, are described, and the use of disk mills in the manufacture of wallboard, saturating felt, container board and paper is outlined.

[1256]. 33.32.3 : 12.25. TURNER, H. D., HOHF, J. P., and SCHWARTZ, S. L. **Effect of some manufacturing variables on the properties of fiberboard prepared from milled Douglas Fir.** *Prepr. U.S. For. Prod. Res. Soc.* No. 14, 1948. pp. 13. 2 refs. P.R.

Presents the results of tests made at the U.S. Forest Products Laboratory using 3 similar pulps prepared by wet-grinding Douglas Fir. The tests included conditions affecting drainage rates, solids content of wet-pressed pulp mats, specific gravity of dried mats and the relationship of fibreboard strength to both specific gravity and the power consumed in fibre processing. *From authors' summary.*

[1257]. 33.32.3. LYNAM, F. C. **Weyroc—man-made timber.** *Timber and Plywood Annual* 1947–8 (168, 170, 172, 174). P.R.

The process of manufacture is based on the use of fibres from various species of timber, according to the qualities needed in the finished material. Chips are broken down, screened, dried to a pre-determined moisture content, mixed with a bonding agent and subjected to heat and pressure. Waste from Douglas Fir,

Spruce and Pine consolidated to a density of 45 lb./cu. ft. will have a modulus of rupture of approximately 2,700 lb./sq. in. So far, only softwood waste has been used commercially, but hardwoods can be used satisfactorily.

[1258]. 33.32.3 : 07.2 : 01.4. **Methods of test for evaluating the properties of building boards.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1712, 1948. pp. 17 + 4 photos, 4 dgms., 1 gph. P.R.

[1259]. 33.32.3 : 31.45. HOLMGREN, B. Självantändning i porösa träfiberplattor. **[Spontaneous combustion in porous fibre-boards.]** *Svensk PappTidn.* 51 (10), 1948 (230–2). [Sw.g.e.] P.R.

Temperature measurements of porous fibre-boards under storage conditions showed that swelling in inadequately dried boards is not the only cause of overheating, and, if neglected, of combustion, though an important factor. Drying appears to be followed by an exothermal reaction which calls for further study.

33.32.4. *Plastics*

[1260]. 33.32.4. GABRIEL, A. E. **Sawdust-binder compositions.** *Mod. Plastics* 25 (8), 1948 (145–7, 200, 202, 204, 206, 208, 210, 212, 214, 216). P.R.

A large number of natural and synthetic resins were tested at Madison for use as binders for sawdust and other wood waste, in an attempt to develop a low-pressure moulding composition. The most suitable binder proved to be diethylene-glycol-maleate polyester, a thermosetting alkyd resin.

33.34. Dyeing and Bleaching of Wood

See also *For. Abstr.* 10 (Nos. 1189, 1297).

[1261]. 33.34. DOWNS, L. E. **Bleaching wood.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1705, 1948. pp. 7. 5 refs. P.R. Also in *Sth. Lumberm.* 177 (2214), 1948 (64, 66, 68). 4 refs.

The information presented is based chiefly on published literature and on material supplied by makers and users of wood bleaches. Very little experimental work has been done on the subject.

33.36. Wood Finishes. Preservation of Wood. Seasoning and Drying

[1262]. 33.36 : 01.6. VAROSSIEAU, W. W. Serie III. Conservering en veredeling No. 1. Algemeen overzicht van factoren, die de duurzaamheid van verf op hout kunnen beïnvloeden. **[Series III. Preservation and improvement No. 1. General survey of factors which may influence the durability of paint on wood.]** *Circ. centr. Inst. Mater. Onderzoek Afd. Hout* No. 5, 1948. pp. 8. 100 refs. [Du.e.] P.R.

A brief survey of previous literature, and a summary of the ground to be covered by further circulars in the series.

[1263]. 33.36 : 31. VAROSSIEAU, W. W. Serie III. Conservering en veredeling No. 1. Eigenschappen van hout, die de duurzaamheid van verf op dit materiaal kunnen beïnvloeden. **[Series III. Preservation and improvement No. 1. Properties of wood which may influence the durability of paint applied to it.]** *Circ. centr. Inst. Mater. Onderzoek Afd. Hout* No. 6, 1948. pp. 15. 16 refs. [Du.e.] P.R.

Discusses briefly the anatomy of wood in relation to the application of paint. Surveys previous experimental work on the subject, with particular reference to that done at Madison [cf. *For. Abstr.* 5 (124)] covering the classification of hardwoods and softwoods by their painting characteristics, the relation between specific gravity and paint durability, the influence of cutting angle, growth rings and width of vessels, and the effect of moisture content.

[1264]. 33.36 : 31.42.1 : 12.21. NEDERLANDSCHE CENTRALE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK. **Wood preserving.** *Dutch Patent* No. 60,929, April 15, 1948. *Chem. Abstr.* 42 (12), 1948 (4302). P.R.

Wood was preserved and painted at the same time by paint containing water-soluble fluoride, equal to at least 5% by weight of the pigment, as a part of the pigment mixture; e.g. raw linseed oil, lithopone as a pigment, white spirit as a diluent, and Pb-Co-Mn resinate as a drier. The lithopone contained 10% by weight of very fine milled NaF. There were 80 volumes of oil, etc., to 20 of pigment. There was no attack by *Coniophora cerebella*, which destroyed

similar wood either blank or painted with ordinary paint.

[1265]. 33.36 : 33.31. SPACKMAN, W., and TIPPO, O. **Wood preservatives, effect on seam compounds and value as paint primers.** *Industr. Engng. Chem.* 40 (7), 1948 (1301–8). 27 refs. P.R.

Water-repellent preservatives of the copper-naphthenate, chlorinated-phenol and phenyl-mercury-oleate types proved to have no harmful effect on calking compounds used to seal the seams of wooden vessels. They have little value themselves as paint primers, but in no way contribute to paint failure if the normal priming coat of paint is applied.

33.36.1. *Preservation against Attack by Plants and Animals*

See also *For. Abstr.* 10 (Nos. 959, 1133–4, 1136, 1189, 1313, 1407).

[1266]. 33.36.1 : 31.1. SCHULZE, B., and THEDEN, G. Über das Eindringvermögen von Holzschutzmitteln und dessen Prüfung: (1) Gesetzmässigkeiten für das Eindringen von Flüssigkeiten in Holz. [**The penetration of wood preservatives and methods of testing it: (1) Laws governing the penetration of liquids into wood.**] *Wissenschaftliche Abhandlungen der deutschen Materialprüfungs-anstalten* 2 (3), 1942 (67-78). 11 refs. [G.g.] P.R.

Discusses the effect of such variables as direction of passage, moisture content of the wood, and concentration of solution (in the case of water-soluble preservatives) on the depth to which oily and water-soluble preservative penetrate into Pine wood. It was found that preservatives penetrate most readily along the rays and from them into the narrow cell spaces of the latewood. In the case of oily preservatives, penetration is unaffected by the moisture content of the wood below fibre saturation, but water-soluble preservatives penetrate more deeply with increased moisture content; when the wood is dry, a dilute solution penetrates more readily, when wet, a concentrated one. Distribution of the preservatives within the wood as revealed by the microscope is discussed and shown in tables.

[1267]. 33.36.1 : 12.26–8 : 33.4. KAUFERT, F. H. **The preservative treatment of Aspen.** *Lake St. Aspen Rep.* No. 19, 1948. pp. 19. 8 refs.

[1268]. 33.36.1 : 33.36.3. SCHULHOF, K. **Drying and preservation of timber.** *Brit. Patent* No. 596,781, July 5, 1944. *Brit. Abstr.* B.I., July, 1948 (318). P.R.

The wood is treated in a chamber in which it is exposed to the products of distillation of wood (or wood-like material, e.g. bark) as they are successively distilled at the progressively rising temperature in an associated wood-distillation plant. Means are provided to remove one set of products from the treatment chamber as its place is taken by the next set of products formed at a higher temperature.

[1269]. 33.36.1 : 01.4. GARLICK, G. G. **New vacuum wood treating process.** *Timberman* 49 (8), 1948 (58, 60, 62).

Describes the 'Dri-Vac' treating process, which by eliminating the need for high pressure or heat treatment permits the use of a quick-drying thinner without danger of fire. The process, which has been tried out in the laboratory, at a pilot plant and on a commercial scale, consists of the application of a series of vacuums without the use of pressure treatment. It is claimed that it is economical to install, offers a quick, safe method of getting deep penetration and heavy retention, and eliminates the need for draining.

[1270]. 33.36.1 : 31.42.11 : 12.21. HABBERSTAD, A. Verfahren zum Abtöten des Hausschwammes (*Merulius lacrymans*) in Mauern. [**Method of destroying dry-rot fungus (*Merulius lacrymans*) in walls.**] *Ger. Patent* No. 709,433, Aug. 16, 1941. *Prev. Deterior. Abstr.* 3 (6), 1947 (W.79). P.R.

A small, flat, electric oven is fastened to the wall at the part affected, by putty or cement. The oven, which is made of fireproof and heat-insulated material, is open to the wall side, which is then heated to a temperature high enough to kill the fungus. The whole area infected is successively treated in this way. It is claimed that this treatment is more effective than the normal use of a blow-lamp which cannot ensure that the fungus has been killed in the interior of the wall.

[1271]. 33.36 1 : 31 42.12 : 33.31. HARTIGAN, D. **The use of chemical dip treatments against sap stain and mould.** *Aust.*

Timb. J. 14 (4), 1948 (237, 239, 241, 272). 6 refs.

A discussion of different preparations and their effectiveness.

[1272]. 33.36.1 : 31.43 : 33.15.2 RICHARDS, A. P., and CLAPP, F. W. **Control of marine borers in plywood.** *Trans. Amer. Soc. mech. Engrs.* 69 (5), 1947 (519–24). L.S.

Results of exposure tests on plywood glued with different adhesives indicate that the addition of a siliceous extender to the adhesive prevents penetration of *Limnoria*, *Teredo* and *Bankia* beyond the first layer. Pholads penetrate in considerably reduced numbers and are dwarfed in size. Service life can therefore be lengthened, but it is reasonable to suppose that in time the borers will reach the 2nd layer.

[1273]. 33.36.1 : 33.31 : 31.43 : 13.2. SCHULZE, B., and BECKER, G. Ergebnisse einer vergleichenden Prüfung der insektentötenden Wirkung von Holzschutzmitteln. 1. Giftwerte von Stoffen bekannter chemischer Zusammensetzung und Schutzmitteln des Handels gegenüber Larven von *Anobium punctatum* und Hausbock-Eilarven. **[Results of a comparative test of the lethal effect on insects of wood preservatives. 1. The poison value of materials of known chemical composition and commercial preservatives on larvae of *Anobium punctatum* and house longhorn beetles (*Hylotrupes bajulus*).]** *Wissenschaftliche Abhandlungen der deutschen Materialprüfungsanstalten* 2 (3), 1942 (11–35). 25 refs. [G.g.] P.R.

Results of tests of the efficacy of 25 inorganic and 16 organic chemical compounds and of 45 oily and 63 water-soluble commercial compounds against attack by *Anobium punctatum* and *Hylotrupes bajulus*, are given in graphs and tables and discussed individually. Certain factors are also discussed in detail: (1) allowance must be made for the length of time (an average of 3 weeks for *H. bajulus* and from 1 to 8 months for *A. punctatum*) that larvae can survive without food; (2) the larger larvae of both species are much more resistant to poison than smaller ones; (3) the growth of larvae of both species is much influenced by temperature and moisture conditions; (4) the effect of the poison increases with the relative humidity of the air but not markedly.

[1274]. 33.36.1 : 33.31 : 31.43 : 13.2. SCHULZE, B., and BECKER, G. Die Fernwirkung von Hausbockbekämpfungsmitteln im Holz und die Prüfung ihrer Reichweite im Tierversuch. **[The action at a distance of preservatives in wood used against house longhorn beetles and tests of their range in experiments on insects.]** *Wissenschaftliche Abhandlungen der deutschen Materialprüfungsanstalten* 2 (3), 1942 (35–40). 5 refs. [G.g.] P.R.

Experiments were carried out with various oily and water-soluble wood preservatives to test the effect of their evaporation on larvae of *Hylotrupes bajulus* separated from them by sections of wood 2, 4 and 6 mm. thick; other variables were temperature, and the direction of the passage of the vapour. It was found that, at a temperature of 20° C.:—(1) the 18 oily preservatives were effective in the direction of the medullary rays (but not in that of the annual rings) in the case of 2-mm. but not 4-mm. sections; seven of them reduced the life of the larvae to half the average (estimated from control specimens). (2) Only 2 of the 7 water-soluble preservatives showed any effect, but one of these ('IPF 90') was effective not only in the direction of the rays but also of the annual rings. This same preservative showed increased effectiveness in the direction of the annual rings at 28°—the only case in which increased temperature appeared to influence the results.

[1275]. 33.36.1 : 31.43 : 13.2 : 33.31. **DDT spray treatment for prevention of *Lyctus* attack.** *Leafl. For. Prod. Res., Lond.* No. 43, 1948. p. 1.

Experiments to date with DDT sprays against *Lyctus* infestation of boards of English Oak, Ash and Elm during seasoning and storage are sufficiently promising to justify use on a commercial scale. The spray is recommended only as a preventive and not for timber known to be infested or already exposed to infestation. Experimental spraying in a commercial yard indicates that cost is reasonable. An emulsion in water containing at least 2% DDT is recommended.

[1276]. 33.36.1 : 33.31 : 31.43 : 13.2 : 31.42. **[Boric acid treatment.]** *Rep. Qd. For. Serv. 1946–7*, 1947 (18).

The preservative treatment of sapwood with boric acid against *Lyctus* attack, raises an associated problem of fungus growth on the

surface of boards and in the solution. In general this is combated by adding a fungicide to the preservative solution, but in this case it has been found that the fungicidal compounds are precipitated by the boric acid and wood extractives, thus neutralizing their fungicidal value.

[1277]. 33.36.1 : 33.31. TAYLOR, K. L. **Preservation of sawn timber with boric acid.** *Timber News* 55 (2099), 1947 (324–6).

[1278]. 33.36.1 : 33.31 : 31.43 : 13.2. BECKER, G., SCHULZE, B., and SCHULZ, E. Prüfung der vorbeugenden Wirkung von Holzschutzmitteln gegen Termiten. [**Tests of the effect of wood preservatives against termites.**] *Wissenschaftliche Abhandlungen der deutschen Materialprüfungsanstalten* 2 (3), 1942 (40–55). 18 refs. [G.g.] P.R.

Describes a new laboratory method of testing the effect of various preservatives on *Calotermes flavicollis*. Results, expressed in graphs and tables, show arsenic compounds, fluorides and fluosilicates to be effective. The organic salts, apart from pentachorophenol and its compounds, are not. Some of the commercial oily preservatives were as effective as creosote; others had no effect.

[1279]. 33.36.1 : 33.31 : 31.43 : 13.2. BECKER, G. Der Einfluss verschiedener Versuchsbedingungen bei der 'Termitenprüfung' von Holzschutzmitteln unter Verwendung von *Calotermes flavicollis* als Versuchstier. [**The influence of various test conditions in 'termite tests' of wood preservatives, using *Calotermes flavicollis* as test subject.**] *Wissenschaftliche Abhandlungen der deutschen Materialprüfungsanstalten* 2 (3), 1942 (55–66). 13 refs. [G.g.] P.R.

The main factors which may hasten or delay death are: resistance of the test subjects to hunger; their size and state of development; their state of nourishment and their numbers; the temperature; the moisture content of the air; and the concentration of the poison used. Experiments relating to these factors are described and the results expressed in graphs and tables.

[1280]. 33.36.1 : 33.53 : 07.7. **Un nuovo trattamento per la conservazione dei pali di legno.** [**A new method of preservative treatment for poles.**] *L' Energia elettrica* 24 (6), 1947 (228). [It.] P.O.

Describes a method of treating poles by injection, patented by the Soc. Cobra of Paris. The peculiar merit of this method is that it permits of treating poles already in use and putting an end to an infection already contracted. The apparatus (illustrated), acts like a powerful syringe and is easy to use; it achieves penetration to a depth of 6–7 cm., and injections are generally made over a zone of 40–60 cm. from ground level, the number of injections varying with the girth of the pole (generally one for every 10 cm. of height and every 4–5 cm. of girth). The preservatives chiefly used are NaF, dinitrophenol and arsenious acid. The rapidity of diffusion depends principally on the nature of the soil, the kind and condition of the wood, and the climatic conditions; it may generally be regarded as complete in 4–6 months. The concentration of the mixture injected is usually 4–5%. It is claimed that poles already substantially infected with rot fungi, can by this method have their life prolonged by 12–15 years; treatment is likely to be effective provided that the infection has not penetrated to a depth of more than one-third the diameter of the pole.

[1281]. 33.36.1 : 33.53 : 12.25. HARKOM, J. F., COLLEARY, M. J., and SEDZIAK, H. P. **Results of the examination of seven ground-line treatments and one butt treatment on Eastern White Cedar pole stubs after six years' service.** [*Prepr.*] *Amer. Wood Pres. Ass.* 1948. pp. 14. P.R.

Tests were made on a total of 231 7-ft. stubs cut from old and new poles of *Thuja occidentalis*. The stubs were divided as follows:—old stubs, 88 for treatment, 18 for untreated controls; new stubs 88 for treatment, 36 for untreated controls. The results, which are tabulated, indicate that all treatments examined were effective in inhibiting decay at the ground line for 6 years, except that in a Cuprinol ground-line treatment there was a very small amount of decay at the junction of heartwood and sapwood. Treatments combining creosote and salt penetration showed least decay in new poles at 33 in. below the ground line, as well as giving complete protection at the ground line.

[1282]. 33.36.1 : 33.53 (595) : 31.41. **Treatment and durability of Meranti poles.** *Malay. Forester* 11 (3), 1948 (127–8).

A large number of Meranti poles are used by Chinese miners in the elevated sluice boxes of

their open-cast tin mines. These poles are 14–30 ft. long and 3–6 in. in diameter. A test was made to determine how much creosote would be absorbed by soaking *Shorea leprosula* poles in cold creosote and how much this cold soaking process would add to their life. The following conclusions were reached:—(1) If the poles are barked, the moisture content can be reduced to about 18% in 2–3 months. (2) At the end of this period the poles will absorb about 3½ lb./cu. ft. of a 50/50 mixture of creosote and Diesel oil if soaked for 24 hours in a cold mixture. Poles seasoned in the open absorbed considerably more than those seasoned under cover. (3) Untreated poles in contact with the ground last about 1¾ years. From available evidence treated timbers should last at least 3 years in swampy ground and 4–6 years in drier areas.

[1283]. 33.36.1 : 53.54 (595) : 12.26–8. **Service tests of fence posts.** *Malay. Forester* 11 (3), 1948 (127).

Fifty Keruing (*Dipterocarpus verrucosus* and *D. baudii*) fence posts, pressure-treated with about 5·5 lb./cu. ft. of equal quantities of creosote and Diesel oil in 1932, are still in service, but about 30% have been somewhat damaged by termites. Of 127 Kempas [*Koompassia malaccensis*] fence posts treated by the Lowry process, half with a 50/50 and half with a 25/75 mixture of creosote and Diesel oil, and set up in 1930, the great majority are still sound and in service. The posts were mixed indiscriminately at the time of erection and the results so far show that those with 25% of creosote have lasted as long as those with 50% and may reasonably be expected to last at least 20 years. The average absorption was the same (6·7 lb./cu. ft.) for both.

[1284]. 33.36.1 : 38.2. MUELLER, L. A. **Protection of rustic finishes against mold attacks.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 61, 1948. pp. 2.

Moulds that discolour transparent varnishes used on log cabins and other rustic buildings, can be prevented by the use of boiled linseed oil with a 5% concentration of pentachlorophenol.

33.36.2. *Fireproofing*

[1285]. 33.36.2. **Report of Committee E-5 on fire tests of materials and construction.** *Proc. Amer. Soc. Test. Mater.* 47, 1947 (436–8). P.R.

Includes a section on fire tests of wood of 2-in. or greater thickness, partially impregnated with fire-retarding chemicals; it is not generally possible to obtain effective impregnation to a depth of more than ⅜–½ in. from the face for most species. This would, however, increase fire safety considerably for exposed structural members treated after manufacture.

[1286]. 33.36.2 : 31.45. **Standard method of test for combustible properties of treated wood by the fire-tube test method.** A.S.T.M. designation No. E 69–47. 1947. Supplement to Book of A.S.T.M. Standards including tentatives. Part II. 1947 (201–5). [American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.] P.R.

33.36.3. *Seasoning. Drying*

See also *For. Abstr.* 10 (Nos. 899, 1268).

[1287]. 33.36.3 (711). **The seasoning of timbers, poles and ties: a study of the air-seasoning rate and moisture gradient in the southern coast region of British Columbia.** *Mimeo For. Prod. Lab., Can.* No. *V*–104, 1948. pp. 10. P.R.

[1288]. 33.36.3 : 12.26–8. **[Seasoning of East African Camphor and Mrie.]** *Rep. For. Dep. Tanganyika 1946*, 1948 (18).

Experiments were made in the seasoning of East African Camphor [*Ocotea usambarensis*] and Mrie (an unidentified species of *Entandrophragma*). Air seasoning of the former to shipping-dry condition, 24% moisture content, was accomplished in 2½ months, and equilibrium was reached in 4–5 months in all sizes up to 6 × 4 in. Difficulty was experienced with the latter species, but there are indications that quarter-sawn material is much more stable than flat-sawn.

[1289]. 33.36.3 : 07.7. SMITH, H. H. **Furnace-type lumber dry kiln. Operation of an experimental unit.** *Sth. Lumberm.* 176 (2213), 1948 (68–70, 72, 74–5). [Forest Products Laboratory, Madison, Wis.]

[1290]. 33.36.3 : 07.7 : 33.12. BOER, L. J. J. Het drogen van hout in de meubelindustrie. **[Wood seasoning in furniture manufacture.]** *Elektrotechniek* 25 (22), 1947 (334–8). [Du.] L.S.

Describes, with diagrams and photographs, an electrically heated seasoning kiln, in commercial use, with a timber capacity of 12 cu.m. and automatic control of temperature and moisture supply.

[1291]. 33.36.3 : 07.7 : 33.15.5. BLOND, L. Le séchage des bois et le collage en haute fréquence. [**High-frequency seasoning and gluing.**] *Rev. Bois Appl.* 3 (5), 1948 (10–15). 10 refs. [F.]

[1292]. 33.36.3 : 07.7 : 33.15.5. BRAJNIKOFF, B. J. **Technical aspects of dielectric heating.** *Timber News* 56 (2107), 1948 (176, 179).

[1293]. 33.36.3 : 01.1 : 33.15.5. BRAJNIKOFF, B. J. **Molecular processes in dielectric heating.** *Timber News* 56 (2108), 1948 (216, 219, 231).

Discusses molecular theory in its relation to the principles of H.F. heating for the treatment of wood, and gives graphs and diagrams illustrating the effect of such factors as an air gap between the electrodes and interposed wood, the arrangement of the electrodes, and variations in power and voltage. Lists the advantage of this method of wood drying and its potentialities, and summarizes in tabular form the effect of varying moisture content in wood of different species on the dielectric constant, power factor, specific gravity and specific heat.

[1294]. 33.36.3 : 33.31 : 12.26–8. PECK, E. C., BAKER, G., and CARTER, R. M. **Chemical treatment and seasoning of thick Beech stock.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1708, 1948. pp. 3 + 5 photos, 3 tbls. P.R.

Experiments in preventing checks and splits in Beech showed that these could be considerably reduced by the application of a proprietary chemical, followed by air seasoning and then by kiln drying.

[1295]. 33.36.3 : 01.4. **New seasoning process.** *Sth. Lumberm.* 176 (2213), 1948 (82).

Satisfactory results are reported from the 'Drysol' seasoning unit operated by the Kelly-Generes Construction Company in New Orleans. The process is a modification of the 'boiling under oil' method. Timber is stacked in an open-top steel tank and immersed in a 'drying fluid' which is thermostatically controlled at about 245° C. A drying schedule of about 5 hr. for 1-in., and 7 hr. for 2-in. timber is required. After the fluid is drained off, the timber is enveloped in steam to relieve case-hardening stresses.

[1296]. 33.36.3 : 12.29 (54) : 31.22.2. REHMAN, M. A., and ISHAQ, S. M. **Seasoning and shrinkage of Bamboo.** *Indian For. Rec. (n.s.) Utilization* 4 (2), 1947. pp. 21 + 3 photos, 4 gphs., 3 dgms., 3 tbls.

Species tested were: *Bambusa arundinacea, B. nutans, B. tulda, B. polymorpha, Dendrocalamus strictus, D. hamiltonii, D. membranaceus, D. calostachyus* and *D. longispathus.* Seasoning characteristics of the different species subjected to kiln and air drying, and drying over an open fire, are described; results of experiments to show the degree of wall shrinkage during the drying under controlled conditions of gradually decreasing moisture content of *B. nutans, B. arundinacea, D. hamiltonii* and *D. strictus* are given in graphs and tables.

33.36.5. *Steaming*

[1297]. 33.36.5 : 33.34 : 31.27. Procédé de vieillissement artificiel des bois. [**A process for the artificial ageing of wood.**] *Bois For. Trop.* No. 6, 1948 (205–6). [F.]

The process is particularly applicable to tropical timbers with wide sapwood and a high starch content. It consists in transforming the starch into dextrine by subjecting it to heat, the transformation usually occurring at about 160° C. The heat is conveyed right to the heartwood by means of steam, which even at pressures of only 1 kg./sq. cm. rapidly penetrates logs and saw-wood of all dimensions and of even the hardest species. The steam is at first applied at a low pressure which is gradually increased to a maximum of 20 kg. while the temperature is simultaneously increased to about 210°. This results in a uniform darkening of the wood, as the starch is transformed into dextrine. Steam pressure and temperature are then progressively reduced until the required degree of dryness is reached. It is claimed that this treatment renders the wood immune to checking and easier to work as well as immune to borer attack. Crushing strength of treated wood is somewhat reduced, whereas tests of rupture show an increase of 5–20% in resistance. Okoumé [*Aucoumea klaineana*] and Limba [*Terminalia superba*] react very well

to this treatment and their colour can be modified by it to that of the various Mahoganies and Walnuts.

33.37-8. Destructive Distillation. Charcoal and By-Products. Use of Wood and Charcoal for Gas Manufacture

See also *For. Abstr.* 10 (No. 968, 1182–3).

[1298]. 33.37–8 : 12.25–9 (4) : 31.1. BROWN, R. C. Beurteilung und Identifizierung der wichtigsten Laub- und Nadelholzkohlen. [**Evaluation and identification of the most important hardwood and conifer charcoals.**] Genossenschafts-druckerei, Zürich. 1945. pp. 120. 21 refs. [G.g.]

A doctoral thesis which presents the results of research on charcoals of all the more important Central European woods, dealing with: (1) Chemical and physical properties (especially those important in charcoal for producer-gas generators) of charcoals retort-carbonized under standard conditions. (2) Identification (brief descriptions accompanied by photographs) of charcoals produced in retorts, kilns and gas-works. (3) Changes in the fine structure of woods during carbonization at 400° and 1,000° C. An appendix examines possible causes of and means of preventing checks during carbonization.

[1299]. 33.37–8 : 01.4 : 07.7. ZORN, R. **Furnace for carbonizing wood by distillation in a closed container.** *Swiss Patent* No. 216,642, Dec. 16, 1941. *Chem. Abstr.* 42 (15), 1948 (5646). P.R.

The apparatus consists of a refractory furnace, heated electrically or by the combustion of fuel, in which is supported a fused-salt bath surrounding the distillation retort. The bath ensures greater uniformity of heating throughout the charge than the usual direct heating. The bath is heated to 450° [C.] and a perforated basket containing the wood is introduced into the retort, which is then closed. The temperature of the wood falls at first and then rises slowly to 250–275°; the distillation is continued until the temperature of the wood reaches 450°. This apparatus may also be used for the production of special charcoals, etc., at lower temperatures.

[1300]. 33.37 (73). BEGLINGER, E. **Some observations regarding the status of the wood-distillation industry.** *Prepr. U.S. For. Prod. Res. Soc.* No. 6, 1948. pp. 6. P.R.

[1301]. 33.37 : 12.26–8. HANLEY, N. A., and PEARSE, J. F. **The destructive distillation of four Western Australian Eucalypts.** *The Australian Chemical Institute Journal and Proceedings* 12 (8), 1945 (263–72). 6 refs. L.S.

The products of the destructive distillation of Jarrah (*Eucalyptus marginata*), Wandoo (*E. redunca*), Karri (*E. diversicolor*) and Marri (*E. calophylla*) were examined, and the composition of the wood gas at various temperatures and the relationship of the volatile content of charcoal to the temperature of retorting were studied.

Marri gave the highest yield of acetic acid and methyl alcohol, and alone gave quantities comparable with those of North American hardwoods. Lower yields were obtained from Wandoo, Karri and Jarrah, decreasing in that order. Yields of fixed carbon were: Jarrah 34%, Wandoo 36%, Karri 30% and Marri 31% of the oven-dry weight of the wood. The wood gas showed little variation in composition with species, and compared closely with that from Pine, Spruce, Birch and Beech. Average yield was 10·1% of the dry weight of the wood. The order of formation of products in the retort with relation to temperature is also discussed.

[1302]. 33.37 : 34.6 : 33.39 : 12.25. FLETCHER, T. L., and HARRIS, E. E. **Destructive distillation of Douglas Fir lignin** *J. Amer. chem. Soc.* 69 (12), 1947 (3144–5). 4 refs. [U.S. Forest Products Laboratory, Madison, Wis.] O.R.S.

A preliminary report on investigations into the destructive distillation of Douglas Fir lignin from the Madison wood-sugar process. Yield of charcoal (55 to 66%) decreased with increasing amounts of residual cellulose and decreased still more when the lignin was washed free of the approximately 1·3% H_2SO_4 remaining in it. Yield of aqueous distillate (13 to 21%) and settled tar (5·2 to 8·9%) increased with increasing residual cellulose content and still more with acid-free lignin. The results of preliminary investigations of the aqueous distillate and settled tar are briefly presented.

[1303]. 33.38.2 : 01.1. HUBENDICK, E. Gasgeneratorns teori IV. Vedgasförfarandet.

[The theory of gas generators, IV. Wood gas.] *Teknisk Tidskrift* 75, 1945 (321–6). [Sw.] L.S.

Compares briefly the generation of gas from coal and wood, and discusses the relations between moisture content, heat losses and calorific value; calculations are expressed in 20 graphs based on wood consisting of 50% C, 44% O_2, and 6% chemically combined H_2O, with a calorific value of 4400 K.cal/kg. of dry ash-free substance.

[1304]. 33.38.2 : 01.4. WIDMER, G. F. Holzentgasung in Horizontalkammeröfen. **[Wood gasification in horizontal chamber ovens.]** *Monatsbulletin, Schweiz. Verein von Gas- und Wasserfachmännern* 24 (10), 1944 (225–30). [G.g.] P.O.

Describes experiments using 3 different methods. Of these the 'alternating' method, where gasification is carried out in 2 adjacent ovens and the gas from one is passed through the other for 4 hrs., after which time the process is reversed, was found most successful. Experiments with peat, using the same method, are also described. Data of gas yield, heating value, and costs for the different methods are tabulated.

[1305]. 33.38.2 : 01.4. BODMER, G. Untersuchungen über Holzentgasung. **[Research on wood gasification.]** *Monatsbulletin, Schweiz. Verein von Gas- und Wasserfachmännern* 24 (10), 1944 (230–9). [G.g.] P.O.

Describes and tabulates the results of experiments with 3 methods of wood gasification. Of these, the normal method caused corrosion of pipes and apparatus and gave poor-quality tar; the 'incandescent' method where the gas is forced through hot charcoal gave gas of low heating capacity; and the 'alternating' method gave a satisfactory degree of cracking and produced gas of proper heating value.

[1306]. 33.38.3 : 01.4. COMPAGNIE FRANÇAISE DE RAFFINAGE. **Process for improving useful qualities of wood charcoal and products thereof.** *Brit. Patent* No. 596,426, 1948. *Fuel Abstr.* 3 (5), 1948 (24). P.R.

The charcoal is treated at atmospheric pressure with large quantities of such substances as pitch, bitumens or tars in a heated and liquid or semi-liquid state, i.e. at temperatures between 100° and 200° C.

33.39. Manufacture of Sugar, Oils, Alcohol, and Miscellaneous Chemical Products from Wood

See also *For. Abstr.* 10 (No. 1110).

[1307]. 33.39 : 01.4. THORBJÖRNSON, B. Försockring av ved med myrsyra. **[Saccharification of wood with formic acid.]** *Svensk PappTidn.* 51 (9), 1948 (206–13). [Sw.sw.g.e.] P.R.

Experiments on the saccharification of Spruce wood with formic acid yielded 64% of the dry weight of the wood as reducing sugars. The results are expressed in graphs and tables. A method of recovering up to 99% of the formic acid after use is described.

[1308]. 33.39. ENEBO, L. Om pH-effekt vid termofil cellulosajäsning. **[The effect of pH in the thermophilic fermentation of cellulose.]** *Svensk PappTidn.* 51 (7), 1948 (157–62). 10 refs. [Sw.g.e.] P.R.

The pH of the medium was found to affect directly the yield of different products of cellulose fermentation. Fermentation time was shortest at pH 7. The yield of ethanol and of formic and lactic acids was highest at about pH 7; that of acetic acid was unaffected by pH within the range pH 5·7–7·1 and the yield of butyric acid reached its optimum at pH 5·7. By fermenting the cellulose at pH 6 or slightly less, it is possible to obtain butyric acid (which unlike the other acids can be extracted fairly easily) as the main product.

[1309]. 33.39 : 12.21 : 12.25. HARRIS, E. E., HANNAN, M. L., MARQUARDT, R. R., and BUBL, J. L. **Fermentation of wood hydrolyzates by *Torula utilis*.** *Industr. Engng. Chem.* 40 (7), 1948 (1216–20). 7 refs. P.R.

Experiments using Douglas Fir hydrolysates show that *Torula utilis* is suitable for alcoholic fermentations. The yield of alcohol from a Douglas Fir wood hydrolysate containing 5% reducing sugar was from 2 to 2·14 g. per 100 ml.

[1310]. 33.39 : 12.21. HARRIS, E. E., SAEMAN, J. F., MARQUARDT, R. R., HANNAN, M. L., and ROGERS, S. C. **Fodder yeast from wood hydrolyzates and still residues.** *Industr. Engng. Chem.* 40 (7), 1948 (1220–3). 10 refs. P.R.

A strain of *Torula* yeast has been grown on wood hydrolysates and on the non-fermentable sugars remaining after alcoholic fermentation of

wood hydrolysates. The most rapid conditions for continuous propagation were at pH 6 when 4·6% sugar solution was fed into the fermentor, which required a throughput time of about 2·5 hours and 200–250 cu. ft. of air per pound of yeast produced. *Authors' summary.*

33.4. *Converted Structural Timber*

See also *For. Abstr.* 10 (Nos. 1139, 1213).

[1311]. 33.4. KÄHR, G. **Improvements in flooring made from wooden blocks.** *Brit. Patent* No. 598,521, 1948. pp. 5 — 15 dgms. P.R.

Wooden blocks are formed into long boards, and adjoining boards, as well as the individual blocks, are held together (1) by means of a tenon inserted and glued into grooves in adjacent surfaces of the rows of blocks; (2) by thin laminae of veneer or the like, inserted between and glued to adjacent surfaces of the rows of blocks; or by combination of both. It is claimed that this method of block flooring is cheaper and simpler than the normal one, that a substantial saving of material is made possible by reducing the height of the blocks, and that the tenons impart increased rigidity and prevent warping.

[1312]. 33.4 : 31.27. **Recommendations for basic stresses.** *Sth. Lumberm.* 177 (2216), 1948 (46, 48, 50).

Revised basic stresses for structural timbers are presented [cf. *For. Abstr.* 2 (302)]. The revisions are the result of an extensive review and analysis of existing data by the Forest Products Laboratory, Madison, from tests of small clear specimens and structural timbers, including a study of variability, the influence of various characteristics on strength, the efficiency of structural grades, the effects of seasoning and other related features.

33.5. *Pitprops. Sleepers. Poles and Other Roughly Converted Wood*

See also *For. Abstr.* 10

(Nos. 1139, 1192, 1229, 1280–3, 1469, 1507).

[1313]. 33.51 : 31.27 : 33.9 : 33.36.1 : 31.42.11. PETERSEN, M. S., and CASH, F. E. **Support of ground, iron-ore mines, Lake Superior district.** *Information Circular, Bureau of Mines, U.S. Department of the Interior* No. 7459, 1948. pp. 29 + 21 photos, dgms., 5 refs. P.R.

Contains lists of timbers used, with their strength values, specifications for mining timbers, information on transport and storage, details of framing construction, causes of failure, preservation, and repair.

[1314]. 33.51 : 33.15.2 : 33.15.3 : 12.25. **[Mine guides of laminated Larch and 'staypak'.]** *Rep. Nth. Rocky Mt. For. Range Exp. Sta.* 1947 (22).

A mine guide is a timber that extends down the full length of the mine shaft and is used to guide the cage carrying men and supplies up and down the shaft. It is usually 5 × 9 in. in cross-section. Experimental laminated mine guides made from Western Larch [*Larix occidentalis*] were installed in a number of copper mines some 3 years ago and have proved superior to guides of solid wood. The practicability of using 'staypak' as a facing material is now being investigated, because of its high resistance to abrasion, a property considered desirable to protect the guides from damage from falling rocks. Preliminary work showed that Larch when compressed to a density of 1·3 has 3 times the abrasive resistance and 10 times the hardness of normal wood.

[1315]. 33.53 (73). ANDERSON, I. V. **Trends in the utilization of pole species and their effect on forest management [in the U.S.A.]** *Proc. Soc. Amer. For. 1947*, 1948 (128–40).

33.6. *Packing Boxes, Crates, etc.*

See also *For. Abstr.* 10 (Nos. 1197, 1213).

[1316]. 33.6 : 31.0 (213). LE RAY. L'utilisation des bois tropicaux pour l'emballage des fruits et légumes nord-africains. **[The use of tropical timbers for packing North African fruits and vegetables.]** *Bois For. Trop.* No. 6, 1948 (158–66). [F.]

Includes tabulated data on 45 species, including commercial name, specific gravity, colour, nail-holding capacity, suitability for veneer cutting, distribution in Ivory Coast, Cameroon, Gabon and Middle Congo. The writer is inclined to think that the use of tropical African timbers for this purpose should be economically as well as physically possible.

[1317]. 33.6 : 31.0 (73). CHAMPION, F. J. **Diversification in the purchasing of container lumber.** *Repr.* from *Chicago Purchaser* March, 1948. pp. [3]. P.R.

Sixty-nine United States timbers are classified according to qualities suitable for crate-making. These qualities are briefly discussed.

[1318]. 33.6 : 33.1 : 34.6. **Car loading utilizes scrap lumber.** *Timberman* 49 (7), 1948 (134, 136–7).

Description of various types of car loading (for the protection of containers in transport), which make use of waste wood.

[1319]. 33.6 : 33.91 (410). **Cases, wood, packing.** *British Specification* No. UK CIS/1814, 1948. pp. 10 + 7 drawings. P.R.

33.7. *Firewood*

See also *For. Abstr.* 10 (Nos. 1182–4).

[1320]. 33.7 (44). LESCUYER. Le bois de chauffage: sa place dans notre économie. **[Fuelwood: its place in our economy.]** *Rev. Bois Appl.* 3 (5), 1948 (7–9). [F.]

Discusses the use of wood to supplement the coal supply in France in relation to: distribution and transport charges; efficient methods of combustion; and preparation of the wood by drying and trimming to fixed dimensions, for ease in packing.

33.8. *Other Manufactured Products*

See also *For. Abstr.* 10
(Nos. 1192, 1205, 1208–9, 1213, 1216).

[1321]. 33.8. HEBBLETHWAITE, C. H. **Planking for small craft.** *For. Prod. News-Lett. C.S.I.R. Aust.* No. 162, 1948 (3–4).

Outlines the properties desirable for planking timbers and lists native species which, carefully selected, should meet these requirements.

[1322]. 33.8 (44). SOULILLOU. Dans la saboterie. **[Sabot manufacture.]** *Rev. Bois Appl.* 3 (5), 1948 (16–17). [F.]

[1323]. 33.8 : 31.0 (94). HEBBLETHWAITE, C. M. **The suitability of Australian timbers for ski manufacture.** *For. Prod. News-Lett. C.S.I.R. Aust.* No. 161, 1948 (2–3).

Considers the properties of 16 Australian timbers in relation to their use for ski manufacture and gives tabular values for their mechanical properties (bending strength, stiffness, hardness and toughness) and density, expressed as a percentage of those of Hickory (*Hicoria ovata*).

[1324]. 33.8 : 33.15.1 : 33.15.2. TYNAN, J. N. **Manufacturing laminated tennis rackets.** *Repr.* from *Mech. Engng., N.Y.* 69 (9), 1947 (735–8). P.R.

[1325]. 33.8 : 33.15.4. **Prefabricated bus roofs.** *Wood* 8 (13), 1948 (216–20).

Describes the manufacture of the Jicwood prefabricated bus roof, designed on the stressed-skin principle, an inner and outer skin being bonded to a core of expanded synthetic rubber. The inner skin, main roof members and parts of the lighting fixtures are of wood, while the outer skin and lighting panel are of light alloy. The roof gives better heat insulation than the old metal type and diminishes drumming and vibration.

33.9. *Grading [including Standard Specifications] and Storage of Converted Timber*

See also *For. Abstr.* 10
(Nos. 1163, 1313, 1319, 1369, 1379).

[1326]. 33.92 : 07.7. SEYMOUR, J. **Economies in timber handling [in sawmills and timber yards].** *Timber & Plywood Annual* 1947–8 (298, 300–1). P.R.

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.2. *Vegetable Products*

See also *For. Abstr.* 10
(Nos. 877, 968, 1070, 1094).

34.21. Fodder Grass and Grazing. Forest litter

See also *For. Abstr.* 10 (No. 894).

[1327]. 34.21 : 07.2 : 01.7. GRIFFITH, A. L. **Grazing and pasture research.** *Proc. 6th silv. Conf., Dehra Dun 1945*, 1947 (177–81).

A summary of investigations into pasture research made at Nagpur in 1939 and 1940. Three sizes of sampling unit were tested:—(A) $\frac{1}{6}$ of 0·001 acre, (B) $\frac{1}{3}$ of 0·001 acre, and (C) 0·001 acre. Size (A) was found to be the most

efficient, though (B) was a close second for ocular estimation. The safe minimum number of sampling units was 20 for (A), 23 for (B), and 28 for (C). For significant differences of an order of 10% between treatment means, the number of replications should be 30. For other papers read at this session see *For. Abstr.* 7 (Nos. 1955–6).

[1328]. 34.21 (54). **The management and improvement of grazing in waste lands.** *Proc. 6th silv. Conf., Dehra Dun 1945*, 1947 (152–61).

Cf. *For. Abstr.* 7 (Nos. 1955-6); 8 (No. 556).

[1329]. 34.21 (75). CAMPBELL, R. S. **Forest grazing in the Southern Coastal Plain.** *Proc. Soc. Amer. For. 1947*, 1948 (262–9). 23 refs.

[1330]. 34.21 (765 : 778). HORNKOHL, L. W., and READ, R. A. **Forest grazing in the Ozarks.** *Proc. Soc. Amer. For. 1947*, 1948 (270–7). 8 refs.

[1331]. 34.21 (764 : 789 : 791). PARKER, K. W. **Forest grazing in the Southwest.** *Proc. Soc. Amer. For. 1947*, 1948 (278–86). 12 refs.

[1332]. 34.21 (77). DENUYL, D. **Forest grazing in the Central States.** *Proc. Soc. Amer. For. 1947*, 1948 (255–61). 5 refs.

[1333]. 34.21 (78 : 79). SMITH, A. D., and STODDART, L. A. **Range lands and livestock operations of the Intermountain and Central Rocky Mountain region.** *Proc. Soc. Amer. For. 1947*, 1948 (312–9).

[1334]. 34.21 (786 : 796). MORRIS, M. S. **The grazing use of forest lands in the Northern Rocky Mountain region.** *Proc. Soc. Amer. For. 1947*, 1948 (303–11).

[1335]. 34.21 (794). HORMAY, A. L. **Forest grazing in California.** *Proc. Soc. Amer. For. 1947*, 1948 (286–96). 4 refs.

[1336]. 34.21 (795 : 797). REID, E. H. **Forest grazing in the Pacific Northwest.** *Proc. Soc. Amer. For. 1947*, 1948 (296–302).

34.24. Tanning Materials. Cork. Bark Products

See also *For. Abstr.* 10 (Nos. 1113, 1235, 1341, 1343).

[1337]. 34.24 (73). ROGERS, J. S. **Potential sources of domestic vegetable tannins.** *Chemurgic Digest* 6 (19), 1947 (281, 283–91 29 refs. D.S.I.R.

Among the materials considered are the barks of *Tsuga heterophylla, T. canadensis, Picea sitchensis, Acacia decurrens, Rhizophora mangle, Quercus marilandica, Q. laevis, Rhus copallina, R. glabra, R. typhina.*

[1338]. 34.24 : 12.25 : 12.11.11. KURTH, E. F., KIEFER, H. J., and HUBBARD, J. K. **Utilization of Douglas Fir bark.** *Timberman* 49 (8), 1948 (130–1).

Samples of Douglas Fir bark were dried, ground and analysed. Lignin content of extracted whole bark averaged 60%, that of the fine fraction of screened bark 72·1%. Tannin content varied from 8% in the bark at the base of old trees to 18% in tops of trees 50–80 years old. The total solubles, extracted successively with petroleum solvent, acetone and hot water, amounted to some 30% of the oven-dry weight of the bark. Results are expressed in graphs. [Cf. *For. Abstr.* 10 (No. 1126).]

[1339]. 34.24 : 12.26–8 (54). **Indian Wattle bark.** *J. sci. industr. Res., India* 6 (11), 1947 (447–9). D.S.I.R.

Research on the Nilgiri Black Wattle, *Acacia mollissima*, has established that the species is identical with the Natal Black Wattle. In Madras Province optimum conditions appear to be an elevation of 5,000–7,500 ft. and a well distributed average annual rainfall of 60 in. or more. The article discusses the acreage of Wattle necessary to make India self-supporting, the acreage available in Madras Province and measures necessary to encourage increased planting.

[1340]. 34.24 : 12.26–8 (54). CHOUDARY, K. S., and NAYUDAMMA, Y. **Avaram bark.** *Journal, International Society of Leather Trades' Chemists* 31 (8), 1947 (284–5). [Institute of Leather Technology, Madras.] P.O.

Compares the leather yield of skins tanned with unstripped twigs and stripped bark of *Cassia auriculata*. No material difference was recorded.

34.25. Christmas Trees. Medicinal and Edible Plants

See also *For. Abstr.* 10 (No. 1364).

[1341]. 34.25 : 12.26–8 : 34.24. BISWAS, H. G. **Tannic acid, B.P., from Myrobalan.** [*Terminalia chebula*]. *J. sci. industr. Res., India* 6B (9), 1947 (122–3). 5 refs. D.S.I.R.

Describes a procedure for preparing tannin from Myrobalan and quotes a report of tests of the chemical characteristics of tannin thus prepared.

[1342]. 34.25 : 12.26–8 : 12.11.11. DAGLISH, C., and WOKES, F. **Hydrojuglone and apparent vitamin C in Walnuts.** *Nature, Lond.* 162 (4109), 1948 (179–80). 8 refs. [Ovaltine Research Laboratories, King's Langley, Herts.]

Spectroscopic and dye titration methods showed that in resting buds and catkins of *Juglans regia* there may be more than 3% of hydrojuglone. During growth and development, this percentage gradually falls, concurrently with a steady increase in the concentration of ascorbic acid.

[1343]. 34.25 : 12.26–8 (54) : 34.24. KAPOOR, L. D., and HANDA, K. L. **Indian Wild Cherry bark.** *Curr. Sci.* 17 (2), 1948 (54–5). [Drug Research Laboratory, Jammu Tawi.] A.P.B.

A chemical analysis of the bark of several Indian species of *Prunus* showed that none of them would be a suitable substitute for *P. serotina* in the manufacture of drugs.

[1344]. 34.25 : 12.26–8 (943) : 12.11.11. HUGHES, G. K., LAHEY, F. N., PRICE, J. R., and WEBB, L. J. **Alkaloids of the Australian Rutaceae.** *Nature, Lond.* 162 (4110), 1948 (223–4).

The authors are examining the alkaloids of a number of Rutaceous genera of the Australian flora, particularly those of the Queensland tropical rain-forest, as part of a general survey of the occurrence and pharmacology of alkaloids in the Australian flora. At least 6 unrecorded alkaloids have been isolated from the 3 rain-forest species *Melicope fareana*, *Evodia xanthoxyloides*, and *Acronychia baueri*.

34.26. Resin. Turpentine. Oils. Gums. Latex, etc.

See also *For. Abstr.* 10 (Nos. 907, 1139).

[1345]. 34.26 (436) : 07.7. MAZEK-FIALLA, K. Moderne Harznutzung und Forstwirtschaft. [**The use of resins today and forest economy.**] *Repr.* from *Jahrbuch, Hochschule für Bodenkultur in Wien* 1, 1947 (167–80). [G.] P.R.

Austria's national economy demands the production of native resins rather than their import from abroad. The article discusses methods of increasing production by tapping species so far relatively untouched (e.g. *Pinus sylvestris*), and by the use of suitable tools [cf. *For. Abstr.* 8 (No. 2657)] and improved methods. Further research is recommended.

[1346]. 34.26 (591) : 34.27. EDWARDS, M. V. **Use of minor forest products in Burma during the Japanese occupation.** *Indian For.* 73 (12), 1947 (532–5).

Outlines methods of distilling crude motor spirit from rubber, and wood oil from the oleoresin of various *Dipterocarpus* spp. Some substitute fibres are also described.

[1347]. 34.26 : 12.25 (469) : 35 : 92. FONTES, J. DE S. M. Dimensões das feridas de resinagem. [**Dimensions of faces in resin-tapping.**] *Pinhal e Resina* 1 (1), 1948 (10–3). [Port.e.] 3 tbls.

A plea for a revision of the Portuguese decrees of February 1938 and onwards, whereby the permissible width of faces in resin-tapping was limited to 9 cm. An argument in favour of faces of 12 cm. in width is supported by figures from experiments conducted at the Pine Experiment Station at Marinha Grande from 1931 to 1934, which illustrate the greater yield obtained from wider faces.

[1348]. 34.26 : 12.25 (469) : 35 : 92. SOUSA, A. C. E. Devemos resinar com feridas esbreitas ou largas? [**Should we tap resin with narrow or broad faces?**] *Pinhal e Resina* 1 (2), 1948 (13–9). [Port.e.]

Answers a request for a revision of the laws limiting the width of faces in resin-tapping to 9 cm. [see preceding abstract]. Wide faces are condemned on the grounds of:—(1) ultimate deterioration of the stand from the point of view of timber production. (2) The greater decline in yield from wide faces over a number

of years. (Figures from the same source as those of the original article are quoted). The author considers that many abuses existing under the present system of leasing stands for tapping could be avoided by establishing some kind of co-operative system.

[1349]. 34.26 (497.2). HRISTOV, C. Kak se otraziha sušata i tehničeskite nedostatŭci pri rabotata vŭrhu smolodobivaneto. [**How drought and technical deficiencies in tapping practice affect resin production.**] *Gorsko Stopanstvo* 2 (1), 1946 (25–9). [Bulg.]

A brief account of Bulgaria's growing resin industry, which started on an experimental basis in 1934. Scots Pine (*P. sylvestris*), which covers some 177,000 ha. of the country and predominates on the S. and S.W. mountain slopes, is the chief species tapped. The German method of channel cutting is in general followed, with depth not exceeding 0·5 cm., freshenings every 3 days over a 5-month working season, and an average annual yield of 1·5–2 kg. per tree. The necessity for careful organization of the work, sharp tools of good quality, and proper training for the workers is stressed.

[1350]. 34.26 : 12.25 (497.2). ČERNAEV, P. Podobren metod za dobivane na smola ot smŭrča. [**Improved method of obtaining resin from Spruce.**] *Gorsko Stopanstvo* 2 (3), 1946 (123–7). 2 refs. [Bulg.]

An account of experiments undertaken in 1943 by the Section of Forest Technology (Central Forestry Research and Control Institute) at the instance of the Bulgarian National Board of Forestry, on the tapping of Spruce (*Picea abies*), with a view to increasing the country's production of resin. This is derived almost entirely from *Pinus sylvestris* and only in negligible amount from *P. nigra* and *P. peuke*, recent figures being:—

1938 . .	12,770	kilograms
1939 . .	14,360	„
1940 . .	46,885	„
1941 . .	59,005	„
1942 . .	83,500	„
1943 . .	88,082	„
1944 . .	84,610	„
1945 . .	150,000	„ (approximate)

The experiments involved tapping 300 mature Spruce trees of d.b.h. 30–60 cm. in the Borovets State Forest, Samokovsko, after the method used in Thuringia and the Schwarzwald, with 3 to 6 channels per tree, according to diameter, and a single end-of-season collection of resin, so as to reduce costs; with results as follows:—

Group I.
Yield after 1 season (1943)—383 g./tree.

Group II.
Yield after 2 seasons (1944)—384 g./tree.

The similar yield after 2 seasons is attributed to losses by evaporation of turpentine. The yield per tree exceeds by 200 g. that obtained in the Leningrad region.

Group III.
Yield after 3 seasons (1945)—322 g./tree.

As it appeared that increased yield from Spruce should be looked for, not from tapping season after season but from increasing the channels per tree, a supplementary experiment in May, 1945, tapped 30 trees with 6–15 channels apiece, the channels being spaced 4–6 cm. apart at the top ends. A total of 279 channels (average 9 per tree) yielded 25·2 kg. resin or 840 g./tree at the end of that season.

During these experiments no fungus or other damage was noticed, apart from insignificant swelling of the stems. Channels should be cut from end of May to mid-June and resin collected at end of October. If all mature Spruce in the country (84,200 ha.) could be tapped, an annual output of 60–80,000 kg. is forecast, at a lower cost per kg. than for Pine.

[1351]. 34.26 : 12.25. VYSOTSKI, I. V. Intensivnȳ metod podsochki sosnȳ. [**An intensive method of tapping Scots Pine.**] *Lesnaya Prom.* 1948 (3), (22–4). [Russ.]

In 1945–6 the author, working in W. White Russia, tried various methods of intensive tapping designed for use in the 1–3 years preceding final fellings. The best method was a new one in which faces are cut at two levels on each stem (one vertically above the other) and worked alternately, 3 freshenings being made at each level before transferring the cup to the other. Each face rests for 9–10 days between tappings, and the seasonal average for the interval between freshenings is 4·5 days as compared with 3·6 days for normal and 2·3 days for intensive working of the faces at a single level. The combined yield for the two faces exceeded that from the ordinary German method with a normal interval between freshenings, by amounts up to 66%. Compared with intensive working of faces at a single

level the new method gave an increased yield (per face or per freshening) of about 20%.

For 3- or 2-year periods of tapping the tops of the first-year faces are at heights of 280 and 100 cm. respectively for the upper and lower series. For the 3-year period the yearly extension of all upper faces is 45 cm. The first-year faces of the lower series are also 45 cm. and those of the next two years about 23 cm. long. In each case the faces for the later years are cut successively lower on the stem. For a 2-year period the upper faces are 60 cm. long in the first and 75 cm. in the second year, while the lower faces are 45 cm. long in both years. Working for a single year begins at 220 cm. and 85 cm. above ground, with faces 75 cm. long in each case. German faces are cut in all the above cases. In stands previously tapped, however, the upper series of faces are American [extending upwards] and the lower German in type. The former have a length of 50 cm. per year, the latter will vary in length according to the length of stem left below the previous tappings.

Upper series of faces give a greater yield than lower in spring, and the converse is true in the autumn, hence the first 2–3 freshenings of the season are made on the upper faces. The first 3–4 freshenings are made at intervals of 3–4 days, and the remainder generally every other day, e.g. 7 rounds will be made in May, 12–13 a month in June–August and 10 in September.

Lower faces gave larger total yields than upper, the difference between the two being the greater, the smaller the vertical distance between them. The upper faces, however, yielded as much as or more than controls (faces at one level only).

Diagrams are included to show sequences and lengths of faces for various periods of tapping in stands tapped or untapped previously.

[1352]. 34.26 : 12.25. SNOW, A. G., JR. **Effect of sulfuric acid on gum yields from Slash and Longleaf Pines.** *Tech. Note Stheast. For. Exp. Sta.* No. 68, 1948. pp. 35. 31 refs.

A summary of results from resin-tapping experiments with sulphuric-acid stimulation over a period of 3 years. The following points emerge:—

(1) Where acid is used no essential difference in yield is obtained from bark chipping and chipping $\frac{1}{2}$ in. deep. A $\frac{3}{4}$ in.-high streak yields more resin than one $\frac{1}{2}$ or 1 in. high.

(2) Over a 3-year period weekly chipping and treatment gave the greatest yields, but the yields declined progressively from year to year as compared with untreated weekly chippings $\frac{1}{2}$ in. deep and $\frac{1}{2}$ in. high. Yields were better sustained with bi-weekly or tri-weekly chipping for a 3-year period. With acid treatment, yields from bi-weekly chipping equalled or exceeded those from weekly untreated chippings. Tri-weekly treated-chipping yields averaged slightly less, but either of the latter methods saves considerable labour and reduces production costs.

(3) Use of more than 2 faces per tree was not practicable on trees of ordinary size. From 2-faced, acid-treated trees, resin yields from each face equalled those from single, untreated faces on trees chipped $\frac{1}{2}$ in. high and $\frac{1}{2}$ in. deep. An increase of the chipping height up to $\frac{3}{4}$ in., or of the width of each of the 2 faces up to $\frac{4}{10}$ of the circumference gave still greater yields, which were fairly well maintained over 2 years, particularly in Longleaf Pine.

(4) One wide, acid-treated face, $\frac{1}{2}$ or $\frac{3}{4}$ of the circumference of the tree, gave a yield equal to or greater than 2 untreated faces per tree over 1 or possibly 2 years.

(5) Slant chipping is as adequate as the usual peak face.

(6) Trees under 7 in. d.b.h. cannot be worked profitably. Yields from trees 7–8 in. d.b.h., when wide, acid-treated faces were cut, about equalled those from untreated, regularly chipped trees averaging 10·5 in. d.b.h.

(7) Acid treatment tends to increase yield to a higher degree in trees of low yield capacity than in trees of high yield capacity. Overall yield from acid-treated, high-yielding trees was 2 to 3 times that from untreated, average-yielding trees.

(8) The addition of iron-corrosion inhibitors to the sulphuric acid, caused no decline in resin production. *From author's summary.*

[1353]. 34.26 : 12.25 : 12.21. TRUE, R. P., and SNOW, A. G., JR. **Effects of inoculations with a *Fusarium* on gum flow from naval stores Pines.** *Abstr.* in *Phytopathology* 38 (7), 1948 (572–3).

Isolates of *Fusarium lateritium* from pitch cankers on *Pinus caribaea* prolonged resin flow from Slash Pine (*P. caribaea*) and Longleaf Pine

(*P. palustris*). Rate of flow from untreated wounds is reduced considerably after 5 days, but when *Fusarium* inoculations were made in the spring, resin flow continued without appreciable reduction for 3 to 4 weeks in Longleaf and 6 to 8 weeks in Slash Pine. Re-inoculations made at different seasons and at different distances above the first wounds failed to maintain the original flow rate. Inoculations made later in the season on additional trees were partially successful on Slash Pine only.

[1354]. 34.26 : 12.26–8 : 12.11.11. MITRA, C., and SIDDIQUI, S. **A note on the chemical examination of Nim blossoms** (*Melia azadirachta*). *Curr. Sci.* 17 (2), 1948 (51). [Council of Scientific and Industrial Research, Delhi.] A.P.B.

[1355]. 34.26 : 12.26–8 (728.6) : 34.27. Importante estudio sobre el árbol del Sirrí o Ciruelo de Monte. [**Important study of *Tapirira brenesii***.] *Rev. Agric., Costa Rica* 19 (9), 1947 (391–7). 5 refs. [Span.] A.C.P.

A study of *Tapirira brenesii* (Sirrí or Ciruelo de Monte), a species exclusive to Costa Rica, growing mainly around San Ramón, province of Alajuela. Its timber is used for bridges, gates and fences, but the tree is most important as a source of seed oil, which it produces in great quantity. Analysis indicates that the oil, when refined, is suitable for human consumption and, although its saponification number is low, could be used in the soap industry. The possibilities of exploitation and cultivation of the tree are worth investigating.

[1356]. 34.26 (47) : 12.26–8. TKATCHENKO, B. La culture de Tung en U.R.S.S. [**Tung cultivation in the U.S.S.R.**] *Rev. int. Bot. appl. Agric. trop.* 28 (303/4), 1948 (32–48). 55 refs. [F.] P.R.

Describes growth conditions, cultural methods, harvesting, and industrial quality of the oil of Tung grown in the U.S.S.R.

[1357]. 34.26 : 12.26–8 : 34.27. MCCORMACK, R. H. **The solvent extraction of oil from acorns.** *Journal of the American Oil Chemists' Society* 24 (9), 1947 (299–303). 28 refs. L.S.

A description of pilot-plant extractions of oil from acorns with *n*-butanol by a centrifugal and a continuous process.

[1358]. 34.26 : 12.26–8 : 34.27 : 12.11.11. CAVALCANTI, M. DA C. P. B. Óleo de castanha de cotia (novo óleo secativo). [**Oil from 'Castanha de Cotia' (a new drying oil)**.] Instituto Nacional de Tecnologia, Rio de Janeiro. 1947. pp. 40 + 3 plates. 28 refs. [Port.]

A study of a new drying oil obtained from the seed of 'Castanha de Cotia', found in the region of the lower Purus, Amazonia. The name 'Castanha' or 'Côco de Cotia' is given to a great variety of Brazilian families and genera, and identification of the tree presented some difficulty. It was ascertained, however, that the fruits used in the experiments came from a tree of the Rosaceae, probably *Licania* sp. aff. *parinarioides*. Extraction of the oil and its physical and chemical characteristics are described. The oil can definitely be classed as a drying oil and experiments proved that it makes a good base for varnish. A comparison is drawn with the properties of other drying oils and with oils from other trees known as 'Côco' or 'Castanha de Cotia'. In its specific gravity and high refractive index, the oil studied resembles Tung and Oiticica.

[1359]. 34.26 : 12.26–8 : 12.11.11. RAOUL, W. A cêra da erva-mate (*Ilex paraguariensis* St. Hil.). [**The wax of Maté (*Ilex paraguensis*)**.] Instituto Nacional de Tecnologia, Rio de Janeiro. 1946. pp. 83 + [1]. 16 refs. [Port.]

All complete analyses of Maté (*Ilex paraguensis*) have revealed the existence of a wax in its composition. The author believes that the waste substances obtained in extracting caffeine from Maté can yield this wax as a valuable by-product. A thorough investigation of the physical and chemical properties of the wax was therefore undertaken—the crude material was analysed, various methods of purification were tested, and the properties of the purified wax examined. Results are detailed. The wax, it is suggested, could be used as a component of finishing substances and cosmetics.

[1360]. 34.26 : 12.26–8 : 12.11.11. WHITE, E. V. **The constitution of Mesquite gum. III. Hexamethyl-3-glucuronosido-methyl-galactoside methyl ester.** *J. Amer. chem. Soc.* 69 (10), 1947 (2264–6). 5 refs. O.R.S.

[1361]. 34.26 : 12.26–8 : 12.11.11. WHITE, E. V. **The constitution of Mesquite**

[*Prosopis juliflora*] **gum. IV. 4-methoxy-D-glucuronic acid.** *J. Amer. chem. Soc.* 70 (1), 1948 (367–9). 8 refs. [University of Idaho.] O.R.S.

[1362]. 34.26 : 12.26–8. STEWART, W. S., BONNER, J., and HUMMER, R. W. **Yield, composition and other latex characteristics of *Cryptostegia grandiflora*.** *J. agric. Res.* 76 (5/6), 1948 (105–27). 19 refs. O.R.E.

[1363]. 34.26. WHALEY, W. G. **Rubber —the primary sources for American production.** *Econ. Bot.* 2 (2), 1948 (198–216). 30 refs.

A review of alternatives to *Hevea* for rubber production.

34.27. Seeds. Fruits. Fibres and Flosses

See also *For. Abstr.* 10 (Nos. 1346, 1355–8).

[1364]. 34.27 : 12.26–8. SAVUR, G. R., and SREENIVASAN, A. **Comparison of the gel setting properties of polyose from Tamarind seed (*Tamarindus indica* Linn.) with fruit pectins.** *J. Soc. chem. Ind., Lond.* 67 (5), 1948 (190–3). 27 refs. P.R.

A comparative study of the jellying properties of Tamarind seed polyose with those of certain fruit pectins shows that with a concentration of the polyose about half that of fruit pectins, firm jellies are obtained under otherwise comparable conditions. *From authors' summary.*

[1365]. 34.27 : 12.26–8 (6). CHEVALIER, A. Quelques *Strychnos* africains inoffensifs ou peu toxiques. **[Some African species of *Strychnos* which are harmless or only slightly toxic.]** *Rev. int. Bot. appl. Agric. trop.* 27 (299/300), 1947 (353–77). [F.] P.R.

[1366]. 34.27 : 12.26–8 : 12.11.11. PAULA, R. D. DE G. **Chemical study of the mesocarp of the Bacury (*Platonia insignis* Mart.).** *Anais Assoc. quim. Brasil* 4, 1945 (173–6). *Chem. Abstr.* 40, 1946 (7309). P.R.

34.28. Bamboos

See also *For. Abstr.* 10 (Nos. 1253, 1296).

[1367]. 34.28 : 12.29. MURAYAMA, S. J. Drenos de bambus. **[Bamboo drains.]** *Rev. Agric., Piracicaba* 22 (11/12), 1947 (323–5). [Port.] A.C.P.

Describes a method of draining agricultural land by means of bundles of Bamboo of equal lengths. The bundles are placed in the drainage channels, no space being left between the end of one bundle and the beginning of the next, and are covered with bricks, tiles or suitable organic material before the drains are filled in. Such a drain will last 8 to 10 years.

34.3. *Products of the Animal Kingdom*

[1368]. 34.3 : 12.26–9 : 34.26. PELLETT, F. C. **Plants useful for bee pasture.** *Econ. Bot.* 2 (2), 1948 (178–97).

Among the trees important for honey production in the U.S.A. are Willows, Maples, *Tilia americana, Liriodendron tulipifera, Oxydendrum arboreum, Diospyros virginiana, Melaleuca leucadendron, Sabal palmetto, Avicennia nitida, Prosopis glandulosa.* *Libocedrus decurrens* is the source of large crops of honeydew from trees which are infested with the Cypress scale; the exudation is stored as honey, sometimes as much as 100 lb. per hive being gathered. Honeydew of a similar nature is sometimes stored from Oaks, Walnuts, Hickories etc.

35. SALE AND DISPOSAL OF FOREST PRODUCTS. TIMBER TRADE

See also *For. Abstr.* 10 (Nos. 967, 1523, 1527).

[1369]. 35 : 01.2 (71) : 33.91. Termes, abréviations et renseignements techniques à l'usage des marchands de bois. **[Terms, abbreviations and technical information for the use of timber merchants.]** Bureau du Mesurage et de la Classification des Bois, Ministère des Terres et Forêts, Quebec. 1945. pp. 109. [F.E.]

Contains a vocabulary of terms used in the timber industry, given in French with the English equivalents, abbreviations of English terms with English and French explanations, and some standards relating to various wood products.

[1370]. 35 : 09.4 : 98.3. Statistiques du bois pour les années 1946–1947. **[Timber statistics for the years 1946–1947.]** Food

and Agriculture Organization of the United Nations, Economic Commission for Europe, Geneva. 1948. pp. 39. [F.E.]

[1371]. 35 (595) : 98 : 33.91. DESCH, H. E. **Malaya revisited.** *Timb. Tr. J.* 185 (3746), 1948 (1609–10).

A brief review of the present situation in the Malayan timber industry. Labour difficulties are complicated by the high cost of feeding employees. Log supplies from the Netherlands East Indies have greatly diminished. The author believes that the rather high standards set by the Empire grading rules are unsuitable for logs obtained from the overmature forests of Malaya. A revision of the rules would be to the mutual advantage of both the Malayan and the United Kingdom markets.

[1372]. 35 (666.8 : 671 : 672). MENIAUD, J. État actuel de la production et du commerce des bois exploités dans nos forêts africaines. **[Present state of timber production and trade in our African forests.]** *Bois For. Trop.* No. 6, 1948 (175–83). [F.]

A general account of the difficulties in the way of a recovery of the timber trade of the French tropical African forests to its pre-war level, with particular reference to the need of finding an outlet for the exceptionally hard timbers of which they are largely composed.

[1373]. 35 (88) : 98.3. SPOON, W. De hout-exploitatie in Suriname tijdens den oorlog. **[Wood exploitation in Surinam during the war [with a summary table of exports for the years 1935–44].]** *Ber. HandMus. ind. Inst. Amst.* No. 207, 1946. pp. 5. [Du.e.] *Repr.* from *Economische Voorlichting* 40 (21), (489).

38. CONSTRUCTIONAL WORKS. ENGINEERING

See also *For. Abstr.* 10 (No. 988).

38.2. *Building Construction. Foundations and Superstructures*

See also *For. Abstr.* 10 (Nos. 1218, 1227).

[1374]. 38.2 : 07.2 (485). MARÉ, E. DE. **Structural timber research in Sweden.** *Wood* 7 (13), 1948 (186–9).

[1375]. 38.2 (54). MATTHEWS, R. H. **Some wartime timber structures in India.** *Timber News* 56 (2107; 2108), 1948 (173–5; 213–5).

Describes with illustrations 4 types of hangar (2 with large spans) using poor-grade unseasoned timber in lengths not greater than 10 ft., the smallest possible quantity of steel work, no bricks and the minimum of wood. The completed experimental structures were subjected to a wind-load test based on Air Ministry requirements and proved satisfactory.

[1376]. 38.2. PYNE, D. W. **Means for securing together timber and other materials.** *Brit. Patent* No. 595,270, 1947. *Timber News* 56 (2110), 1948 (318).

The device consists of a main element, provided at one or both ends with an expansible tubular end portion, having an open end and a co-acting plug. The construction and arrangement is such that when the end with the plug fitted therein is forced into a suitable preformed passage in the timber, the plug will abut the end of the passage and expand the end portion of the main element to grip the interior of the passage.

[1377]. 38.2 : 31.27. REECE, P. O. **Timber connectors.** *Structural Engineer* 26 (5), 1948 (275–317). 9 refs. P.R.

Discusses the different types of timber connector and describes experiments carried out at Princes Risborough using 'Bulldog' connectors with variables (1) diameter of connector, (2) diameter of bolt, (3) direction of loading. Results are expressed in graphs and tables, and basic loads are given in tabular form.

[1378]. 38.2 : 33.15.1 : 33.15.2. KENNEDY, D. E. **The construction and testing of a glued laminated wooden arch of 47-foot span.** *For. Chron.* 24 (2), 1948 (146–51). [Forest Products Laboratories, Ottawa.]

Cf. *For. Abstr.* 9 (p. 392).

[1379]. 38.2 : 33.4 : 33.91 : 31.27. WALTERS, R. T.; LATHAM, J. **Agricultural buildings: standard components for the M.A.F. scheme. [1] Design of standard timber components. [2] Strength tests on roof truss and purlins.** *Wood* 7 (13), 1948 (198–203).

[1380]. 38.2 (481) : 92. MATHIESEN, H. K. Planmessig bygging av skogshusvær. [**Planned building of cabins for forest workers and stables for horses.**] *Tidsskr. Skogbr.* 56 (1/2), 1948 (22–4). [Nor.] See also text of a new law on this subject, in *Tidsskr. Skogbr.* 56 (1/2), 1948 (38–9).

In 1946 the Stor-Elvdal local forestry board began work on a plan for building workers' cabins and stables for horses used in forestry work. The coöperation of forest owners, workers, and housing inspectors was sought and 25 of the 75 new buildings required in the district have now been constructed. Where a building is used in common by employees of several owners, a suitable contract is drawn up between the parties. The idea was taken up by the forestry authorities and a law has now been passed under which a local forestry board may, if the need exists, work out a plan for the suitable accommodation of men and horses engaged in forestry work. The owners and workers are to be consulted in such cases, and a vote is to be taken on the plan. Where the parties disagree on the distribution of the costs, the forestry board may determine their allocation. In case of need, existing accommodation can be requisitioned if not in use by the owner, and the forestry board must settle the conditions of use.

4. FOREST INJURIES AND PROTECTION

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

See also *For. Abstr.* 10 (No. 1063).

42.1. *Air Currents*

[1381]. 42.1 (498) : 11.12. BARONCEA, E. Două cazuri de foehn în Carpaţii Orientali. **[Two examples of foehn in the Eastern Carpathians.]** *Rev. Pădurilor* 63 (2), 1948 (29–35). [Rum.f.]

A meteorological account of the origin and causes of the foehn-like west winds which caused great damage to forests in the Eastern Carpathians in Dec. 1947 and Jan. 1948. The prevailing winds in this area being from the east, coupes are generally planned with a view to avoiding windthrow from that quarter.

42.2. *Temperature Influences*

See also *For. Abstr.* 10 (Nos. 920, 1028, 1412, 1465).

[1382]. 42.21 : 12.25 (481) : 23.26. HEDE-MANN-GADE, E. Om frostskador på granplantor. **[Frost damage to Norway Spruce nursery stock.]** *Skogen* 35 (11), 1948 (137). [Sw.]

Norway Spruce plants, particularly tall ones (élite plants and 'plus variants'), suffered severely in many nurseries in S. and central Sweden in the winter of 1946–47, owing to the intense cold and poor snow cover. Provided that the terminal bud is undamaged, such plants have remarkable powers of recovery. The author therefore decided in spring 1947 to allow all beds of damaged 2/1 Spruce to stand over for a further year. All beds recovered during the summer, mortality was fairly low, and growth satisfactory. In these nurseries 1/0 and 2/0 Spruce was free from damage. Worst damage occurred to 2/2 Spruce, which, owing to its size, could not be left in the beds. This stock was offered to the more discerning forest owners in the county of Stockholm with a promise of replacement in 1948 if the plants should die during 1947. No claims had been made at the time of writing, though some were still expected in view of the exceptionally hot summer of 1947.

In two nurseries a number of 2/1 Spruce beds of various provenance were selected and all the plants were graded by a 6-point scale according to the extent of damage. Part of each plot was left intact and the remaining plants were put out on adjacent forest land. Results of an inspection in October, 1947, are tabulated. They show that, except in the first two grades, mortality was comparatively high. Earlier experiments had given a much more favourable result, and the present results are attributed to the hot summer of 1947.

[1383]. 42.21 : 12.26–8. MARR, J. W. **Frost injury to Aspen in Colorado.** *Abstr.* in *Bull. ecol. Soc. Amer.* 28 (4), 1947 (60). A.P.B.

A study of frost injury to *Populus tremuloides* after the opening of the buds. Leaves with frosted margins survived and sometimes grew to several times their normal size, but remained deformed. When several leaves were killed but the twig survived, later formed leaves were several times their normal size. Where both the twig and leaves were killed the entire twig, including several years' growth, fell. Extent of the die-back could be correlated with the colour of the tree bark, averaging 15% in trees with yellowish-white bark and 8% in trees with greyish-white bark.

[1384]. 42.22 (498). VLAD, I. Influenţa secetei asupra vegetaţiei forestiere din Bărăgan in anii 1945 şi 1946. **[Effect of drought on the forest vegetation of the Baragan steppe in the years 1945 and 1946.]** *Rev. Pădurilor* 63 (2), 1948 (38–41). [Rum.g.]

The 1945 and 1946 seasons were characterized by lack of rain and unusually high temperatures, which caused serious die-back of trees in the Baragan steppe, sometimes affecting whole stands, particularly young plantations. Exotic species proved particularly susceptible to injury, whereas the indigenous species were fairly resistant, with the exception of the Elms (*Ulmus foliacea, U. procera,* and *U. effusa*). Exotic conifers proved much more susceptible than broadleaved species. All species (both exotic and indigenous) suffered most when they were growing in an unfavourable environment. Deciduous species, especially coppice growth, lost their foliage much earlier than usual. The

drought caused a great increase in insect pests and encouraged the growth of fungi. The attacks of *Galeruca luteola* on Elms, and *Geometra* sp. on *Robinia* were particularly severe. Annual growth rings and annual shoots were both much reduced.

[1385]. 42.22 : 12.25 : 31.8. BUCHWALD, N. F. Tørkespalter i staaende Rødgran. **[Drought cracks in standing Norway Spruce.]** *Dansk Skovforen. Tidsskr.* 33 (5), 1948 (196–9). 3 refs. [Dan.]

Longitudinal cracks in the stems of 15- to 30-year-old trees in the Gaunø-Linderswald Forest District were discovered in September, 1947, and are attributed to the extreme drought in that year. A similar case, discovered in July, 1936, but hitherto unpublished, is also considered to have been caused by drought.

[1386]. 42.22 : 12.25 (943). **[Drought resistance of exotic Pines in Queensland.]** *Rep. Qd. For. Serv. 1946–7*, 1947 (6).

One of the most severe droughts on record was experienced during the year 1946–47, and data were collected on the behaviour of the main plantation species. Hoop Pine was outstanding in its resistance. Of the widely used exotics, *Pinus patula* stood the drought better than *P. caribaea*, which was itself better than *P. taeda*. *P. longifolia* has been very little planted, but no losses were recorded with that species.

42.3. *Precipitations*

See also *For. Abstr.* 10 (Nos. 1430, 1438–40, 1465).

[1387]. 42.32 : 12.25. CARLSSON, J. R. Snötryck i plantskog. **[Injury by snow pressure in sapling stands.]** *Skogen* 35 (12), 1948 (145). [Sw.]

The author has kept records, in the form of scale diagrams of the stems, of 24 plants (23 Norway Spruce and 1 Scots Pine) which were badly deformed by snow pressure in 1934–35. These, of which 12 examples are given, indicate that such damage may be far less serious than would appear at the time of its occurrence. Of the 24 plants, about half have developed a sufficiently straight stem during the 13 years of observation. Rapid-growing dominant plants recovered comparatively quickly.

42.5. *Chemical Influences. Nutrient Deficiencies*

See also *For. Abstr.* 10 (Nos. 888, 1464).

[1388]. 42.5 : 12.26–8 : 31.1. MARTS, R. O. **Abnormal growth in xylem and phloem of *Quercus marilandica* Muench, following application of chemicals.** *Abstr.* in *Bull. ecol. Soc. Amer.* 28 (4), 1947 (65). A.P.B.

Stem and root specimens of *Quercus marilandica* which had survived poisoning with 2,4-D and ammonium sulphamate revealed striking and abnormal tylose formation in the springwood vessels of the outermost growth layer of the stem and some occlusion of summerwood vessels. Instances of increased and irregular cambial activity were also evident, giving rise to some anomalous tissue, to enlarged tracheary elements and excessive parenchyma production. Roots showed tylose formation in some vessels.

43. FOREST FIRES

[1389]. 43 (492) : 09.4. STEYN, VAN, and WARINGA, S. Bos en heidebranden in 1945 en 1946. **[Forest and heath fires in 1945 and 1946.]** *Mededelingen, Nederlandsche Heidemaatschappij* No. 4, 1948. pp. 12. [Du.] X.

Statistics, with a general commentary, of forest and heath fires in Holland during 1945 (the year of the liberation and in many ways an abnormal one from the point of view of fires and fire-fighting) and 1946. Among aspects covered by the tables are total numbers of fires, total area, financial loss, weather conditions, distribution of fires by season, district and type of land, and causes of fires.

[1390]. 43 (741). WILKINS, A. H. **The story of the Maine forest fire disaster.** *J. For.* 46 (8), 1948 (568–73).

Among the predisposing factors to the Maine forest fire disaster of October and November, 1947, were:—(1) the fact that slash hazard from the hurricane of 1938 had not been entirely eliminated, (2) the severe snowstorm of 1945 had caused much tree bending and branch and top breakage, and (3) accelerated felling methods had been used during the war and since, to meet an enormous timber demand. About 220,000 acres of forest, hay, fields and pastures were burnt. An account of the course of the fire and control measures is

given. The author points out the need for centralized control and a single authority to handle such situations.

43.0. *Predisposing Factors and Causes*

[1391]. 43.0 (775). BUETTNER, A. A. **Misuse of the fire danger meter.** *Fire Control Notes* 9 (2/3), 1948 (47–50).

The Lake States Burning Index was prepared as a result of many experiments with different fuel types, temperatures, air and fuel moistures, long and short periods of drought and large and small amounts of precipitation, and gives an accurate burning index on these factors. The writer shows how it can be and is misused and recommends that:—(1) Burning index for the district should be determined by using the lowest average district precipitation rather than headquarters reading. (2) Fire danger should be calculated from the 3 factors, burning index, risk (i.e. cause of fires—farmers, sportsmen, berry-pickers etc.), and fuel type, instead of burning index alone.

[1392]. 43.01 : 11.14 : 01.7. GISBORNE, H. T. **Calculating precipitation probabilities.** *Timberman* 49 (10), 1948 (58, 60, 62, 64, 66).

Describes a method of calculating the probability of occurrence of a given amount of rain in a particular area during a specific 10-day period. The calculations are based on patterns established by long-term and recent observations. Precipitation amounts for each day at all regular meteorological stations are published by the U.S. Weather Bureau. From records of 35 years, totals of precipitation for 10-day periods can be calculated and tabulated, with a column for each period and a line for each year. With such data the frequency of occurrence of given amounts of rain (e.g. 0·20, 0·40 and 1·00 in. and more) can be calculated and plotted in percentages. Thus in the period from 1st–10th April, 27 cases of 0·20 in. or more gives a frequency of 27/35 = 76%, and the odds of 0·20 in. or more rain in this period are 76 to 24. If the weather pattern is thought to have changed in recent years, such long-term computations are not sufficient. The original data should be re-examined and plotted by separate 10-year periods, from a comparison of which any significant trends will become apparent.

43.1. *Protective Measures (including Controlled Burning)*

See also *For. Abstr.* 10 (Nos. 997–8).

[1393]. 43.1 : 07.7. KERN, J. C. **First extensive use of the helicopter in forest fire control.** *J. For.* 46 (7), 1948 (487–92).

Gives a summary of operations during 3 days of fighting and two of mopping up and patrol in a serious fire in the Angeles National Forest, California, August, 1947. A helicopter was used to fly 14,600 lb. of supplies to camps and 300 fire fighters to critical points, to evacuate 15 casualties and on numerous scouting, briefing, patrol, and miscellaneous missions. It is estimated that the use of a helicopter on this occasion shortened control time by 2 days with a saving of some $18,000 of suppression costs. Various other advantages, including good effect on the morale of front-line fire fighters, are discussed.

[1394]. 43.1 : 07.7. FUNK, I. C., and MILAM, F. W. **The helicopter—Bell Model 47B.** *Fire Control Notes* 9 (2/3), 1948 (5–12).

Specifications, test operations and performance of this machine are given. The tests indicate that, when flown by pilots experienced in flying helicopters in mountainous areas, it is suitable for fire-control operations up to an elevation of 6,000 ft., provided that landing places are available. In timbered areas with few bald ridge-top spots for landing, its usefulness is limited. But even in the most difficult conditions the Bell Model 47B can be depended upon to carry suitable pay loads to and from landing spots up to 3,200 ft., and limited loads of strategic supplies to and from landing spots at higher elevations.

[1395]. 43.1 : 07.7. WHITE, H. M. **The disk-dozer.** *Fire Control Notes* 9 (2/3), 1948 (19–23).

This implement, designed for attachment to a Beetle Tractor, is very effective for clearing and trenching fire control lines. Details are given of its construction and performance.

[1396]. 43.11 : 07.7 : 11.47.21 : 32.29.2. RUNQVIST, O. 'Eldkastaren'—ett nytt hjälpmedel vid hyggesbränning. [**The 'flame-thrower'—a new tool for burning cut-over areas.**] *Skogen* 35 (9), 1948 (108–9). [Sw.]

In the Ovanåker district, Hälsingland, promising results have been obtained from

preliminary trials of an ordinary back-pack pressure sprayer (TT type, as used in orchards) employed as a miniature flame-thrower. No modifications were made, except that the tube carrying the nozzle was lengthened to 2 m. This tube might with advantage be still longer and could be provided with a Bamboo support; the hose might also be shortened to prevent its catching in obstacles. The fuel used was motor kerosene, mixed with waste oil to give a slower rate of burning. No figures are quoted for fuel consumption, as this varies greatly with weather, ground cover, etc.

With this apparatus it is generally easy to get a continuous fire front, or, where that is impossible, to mop up any areas missed by the fire. Whether in controlled burning or forest fire fighting, it is also suitable for counter-firing. Burning can be done under conditions that would render ordinary burning difficult or impossible, and the period for burning can be extended well into the autumn. Some tests have been made of burning to prevent coppicing, but results are not yet available. Photographs are included of the apparatus in action.

[1397]. 43.11 : 34.3 (774) : 91.1. SMITH, N. F. **Controlled burning in Michigan's forest and game management programs.** *Proc. Soc. Amer. For. 1947*, 1948 (200–5). 3 refs.

The use of controlled burning is recommended for the maintenance of open areas and the control of size and density of woody cover, necessary in wildlife management.

[1398]. 43.11 (755 : 756). POMEROY, K. **Observations on four prescribed fires in the coastal plain of Virginia and North Carolina.** *Fire Control Notes* 9 (2/3), 1948 (13–7).

For the season and region involved, conditions that combine to make a Class-3 danger rating are required to develop a fire that will spread readily in a cut-over slash area. On days of Class-3 danger rating, crowns of seed trees may be badly injured by flare-ups, and it is important to move brush piles away from seed trees. The total cost of prescribed burning was relatively high, because of the safety measures required. A good initial flush of seedlings was secured when an ample supply of seed was available. The reduction of hardwood competition was of short duration, as most of the injured hardwoods sprouted during the first growing season after the fire.

[1399]. 43.13. HOLMES, C. F. **Common errors in fire fighting.** *For. Chron.* 24 (2), 1948 (135–40).

[1400]. 43.13 : 07.7 (711). MACKAY, R. N. **Pumps challenge the forest fire menace.** *Timber of Canada* 8 (10), 1948 (37, 78, 80, 82–3, 86).

A discussion of fire pumps and their performance. As a result of tests on existing pumps by the National Research Laboratories and the Dominion Forest Service, it is recommended that the ideal unit should discharge not less than 20 gal./min. at 200 lb. pressure, from a pump of the centrifugal or other non-positive displacement type. The unit should be equipped for backpacking and weigh not more than 100 lb.

[1401]. 43.13 : 07.7. **New MacDonald-Bennett pump is back pack type.** *B.C. Lumberm.* 32 (7), 1948 (61).

Describes a portable fire-fighting apparatus, designed at the B.C. Forest Service Marine Station. It contains enough petrol to last for 2 hours, and includes 110 ft. of 1-in. hose, a pump, a light aluminium carrying frame, a tool kit, nozzle and carrying sack. The complete unit, which is carried on the back, weighs only 40½ lb. The 1·1-h.p. motor delivers a stream at 90–100 lb. pressure, pumping about 11·89 gal. per minute.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

44.1. *Forest Weeds*

[1402]. 44.1. DAY, M. W. **The chemical control of certain forest shrubs: a progress report.** *Quart. Bull. Mich. agric. Exp. Sta.* 30 (4), 1948 (427–36). 4 refs.

Experiments with some chemical weed killers as a means of controlling several species of shrubs and trees indicated several possibilities. Ammonium sulphamate was most effective on Hazel. The other species usually sprouted strongly following treatment. Sprays containing 2,4–D were the most promising of those tried. Even the most resistant species were susceptible to some applications. In general, the esters were more effective than the

sodium salt. Concentrated solutions gave promise of preventing re-sprouting of some species when applied as fresh-cut-stump sprays. The dinitro-phenolic contact sprays resulted in an immediate killing of the aerial portion of the shrubs, but sprouting was immediate and vigorous in many cases. When applied as a stem spray this substance was especially effective on Aspen and Pin Cherry. *Author's summary.*

[1403]. 44.1 (729.1) : 12.26–8. THIMANN, K. V. **Use of 2,4–D weedkillers on woody weeds in Cuba.** *Science* 106 (2743), 1947 (87). [Harvard University.] O.R.S.

Various preparations of 2,4–D were tested on plots of large, well established plants of *Dichrostachys nutans*, which had regenerated from cut stumps. 2,4–D sodium salt, 0·3% plus Carbowax 1500, 0·5%, applied once, was considered most effective, although 2,4–D ester, 0·3%, applied once, gave the quickest defoliation. The ester preparation 'Weedone' was more effective against *Comocladia dentata*. These experiments offer possibilities for hitherto irreclaimable land.

[1404]. 44.1 (729.1) : 12.26–8 : 41. THIMANN, K. V. **Use of 2,4–dichlorophenoxyacetic acid herbicides on some woody tropical plants.** *Bot. Gaz.* 109 (3), 1948 (334–40). 12 refs. O.B.D.

A single spraying of 2,4–D was almost completely destructive to Aroma Marabu (*Dichrostachys nutans*) in Cuba. Addition of 0·5% Carbowax definitely increased the toxicity. With Guao (*Comocladia dentata*) ordinary sprays were only moderately effective, but Weedone gave at least a 75% kill within 6 weeks. Some difficulties in assessing toxicity on woody plants and the influence of stomatal openings and other conditions are discussed. *From author's summary.*

[1405]. 44.1 : 41 (969). TAM, R. K. **Comparative herbicidal value of 2,4–dichlorophenoxyacetic acid and 2,4,5–trichlorophenoxyacetic acid on some herbaceous weeds, shrubs and trees under Hawaiian conditions.** *Bot. Gaz.* 109 (2), 1947 (194–203). 11 refs. [Pineapple Research Institute, Honolulu.] O.B.D.

The effects were investigated of 1,000–2,000 p.p.m. aqueous solutions of 2,4–dichlorophenoxyacetic acid (2,4–D) and 2,4,5–trichlorophenoxyacetic acid (2,4,5–T) on some herbaceous weeds, shrubs and trees under warm, humid Hawaiian conditions. Some woody species were also tested with 2% concentrations of the chemicals in diesel oil. Except to Guava (*Psidium guajava*), 2,4,5–T proved more toxic than 2,4–D to all the woody species tested. This difference was more marked in the case of *Eucalyptus citriodora*, and was further demonstrated when 40- to 50-ft.-tall trees of *E. citriodora* were girdled, and concentrated Carbowax solutions of the two compounds were applied to the cut area. With the 2% diesel solutions, the two compounds were equally toxic to several woody species tested, except for Lantana (*Lantana camara*), which proved the most resistant, but was successfully destroyed by one spraying of the 2% solution of 2,4,5–T.

[1406]. 44.1 : 12.29 : 21.3. MCDERMOTT, R. E., and AIKMAN, J. M. **Root relationships in the competition between some tree and grass species.** *Abstr.* in *Bull. ecol. Soc. Amer.* 28 (4), 1947 (57). A.P.B.

44.3. *Fungi*

See also *For. Abstr.* 10 (Nos. 917, 953, 1005, 1127, 1433, 1465–6).

[1407]. 44.3 : 41 : 33.36.1 : 33.31. HORSFALL, J. G. **Fungicides and their action.** Chronica Botanica Co., Waltham, Mass. 1945. pp. [xiii] + 239 + 1 drawing. Many refs. Price 30*s.*

[1408]. 44.3 : 12.25–9 : 12.21 (73). DAVIS, S. H. **Organic fungicides in the control of certain shade and ornamental tree diseases.** *Abstr.* in *Phytopathology* 38 (7), 1948 (575).

[1409]. 44.3 : 41. PALMITER, D. H. **Field tests of fungicides for phytotoxicity and their compatibility with other spray materials under Hudson Valley conditions.** *Rep. N.Y. St. agric. Exp. Sta. 1947*, 1948 (38).

Sulphur, Fermate, Dithane He 178e, Puratized 806, 341, and 337 were used on fruit trees in combination with 50% wettable DDT. No evidence of injury was noticed with any of the DDT combinations.

[1410]. 44.3. AARON, I. **Any fungus that causes decay of heartwood is a pathogen.** *Science* 106 (2742), 1947 (62). 4 refs. D.S.I.R.

From the time it appears, heart rot will interfere in a cumulative manner with the normal growth of a tree. By reducing the capacity of the heartwood to act as a reservoir, it will interfere with the production and differentiation of tissue, and therefore with the movement of water and the translocation of solutes. The author maintains that in such circumstances any fungus causing heart rot can be called a pathogen.

[1411]. 44.3 : 12.21. URI, J. Het parasitisme van *Nectria cinnabarina* (Tode) Fr. [**The parasitism of *Nectria cinnabarina*.**] H. Veenman & Zonen, Wageningen. 1948. pp. 88. 80 refs. [Du.du.e.] P.R.

The results of inoculating pruning wounds of different species with cultures of *Nectria cinnabarina* show: (1) that infection is usually most successful after the winter rest period but may appear at any other season; (2) that the virulence of cultures varies, and decreases after prolonged culturing; (3) that various factors, including species and season, influence susceptibility of branches to infection; thick branches die back more rapidly than thin ones of one or two years' growth; newly transplanted trees appear less susceptible than established ones; within limits, root-pruning gives protection; (4) that the reaction of the wood vessels of many species to the presence of the culture is characteristic.

In fluid media in which the mycelium of *Nectria cinnabarina* is growing, a substance is formed which inhibits the growth of *Pythium debaryanum*. Pruning wounds made in the spring are easily infected by *N. cinnabarina*, and the disinfecting of knives after each incision is desirable.

[1412]. 44.3 : 12.25 : 12.21 : 47 : 42.21. **Larch canker.** *Leafl. For. Comm., Lond.* No. 10 (revised), 1948. pp. 5.

Revision of a leaflet first issued in 1927. It is now held that the most important primary factor concerned in die-back and canker of European Larch is frost, which kills or damages the cambium while it is active; spring frosts are believed to be the most frequent cause of damage. The fungus *Dasyscypha willkommii* then invades the injuries so caused, enlarges them, and by preventing healing renders them liable to further frost damage in subsequent years. Canker occurs mainly in plantations on frost-liable sites and the supposed connexion between high soil fertility and the disease is due to the fact that, in hilly districts, much of such land lies in the valley bottoms. Seed of Scottish provenance, careful choice of frost-free sites, and careful cleaning to reduce competition are recommended.

[1413]. 44.3 : 12.25 : 12.21 (689). ***Armillaria mellea* in Nyasaland.** *Rep. For. Dep. Nyasald. 1946*, [1948?] (6).

Armillaria mellea is widespread in Nyasaland, attacking Tea, Tung, and many exotic species. Among exotic Pines, *P. longifolia* suffers most, followed by *P. khasya* and *P. caribaea*. *P. patula* seems to be almost entirely unaffected. As a precautionary measure, ring-barking of all indigenous species will be carried out one year before clearing new areas for planting.

[1414]. 44.3 : 12.25 : 12.21 (79). CHILDS, T. W., and BEDWELL, J. L. **Susceptibility of some White Pine species to *Cronartium ribicola* in the Pacific Northwest.** *J. For.* 46 (8), 1948 (595–9). 6 refs. [Division of Forest Pathology, U.S. Department of Agriculture.]

Tests of 5,210 Pine trees of various species, planted in Oregon and British Columbia and examined annually during periods of 5 to 11 years indicated the following order of susceptibility to White Pine blister rust (*Cronartium ribicola*):—Resistant—*Pinus armandi*, *P. griffithii*, and *P. koraiensis*; moderately susceptible—*P. aristata* and *P. peuce*; susceptible—*P. flexilis* var. *reflexa*, *P. strobus* and *P. flexilis*; very susceptible—*P. monticola*; exceedingly susceptible (with some individual exceptions)—*P. lambertiana*. *P. albicaulis* is apparently the most susceptible member of the genus. *From authors' summary.*

[1415]. 44.3 : 12.25 : 12.21. BERK, S. **Inoculation experiments with *Polyporus schweinitzii*.** *Phytopathology* 38 (5), 1948 (370–7). 8 refs.

Polyporus schweinitzii is very destructive of White and Red Pine planted on abandoned fields in New York State. The land affected was forested with mixed hardwoods and conifers until cleared about 75 years ago. In order to determine whether the widespread

occurrence of the disease was due to dissemination of spores from outside, or to persistence of the organism as a saprophyte in the soil or weakly parasitic on the roots of hardwood seedlings and herbaceous plants, the author undertook a series of inoculation experiments. The results of the investigation indicate that *P. schweinitzii* is not capable of parasitizing roots of hardwood seedlings under the conditions of this study. In autoclaved soils of the various series inoculated with the fungus, the organism is capable not only of surviving but of making rapid growth. In natural conditions, however, it appears to be suppressed by fast growing species of *Fusarium*, *Penicillium* etc. In autoclaved Pine-needle duff saturated with 2% malt agar, conditions of growth were apparently optimum for the fungus but very unfavourable for the host. The author inclines to the view that the fungus may become parasitic only when the host is growing under very unfavourable conditions.

[1416]. 44.3 : 12.25 : 12.21. BOUDRU, M. La maladie du sapin de Douglas et d'autres conifères, causée par *Phomopsis pseudotsugae* Wilson. **[The disease of Douglas Fir and other conifers, caused by *Phomopsis pseudotsugae*.]** *Bull. Soc. for. Belg.* 55 (6), 1948 (193–201 + 4 photos). 17 refs. [F.]

[1417]. 44.3 : 12.25 : 12.21 : 45.3 : 13.2 (493). BOUDRU, M. L'état sanitaire, en Belgique, du sapin de Douglas (*Pseudotsuga taxifolia* Britt.). **[The health of Douglas Fir in Belgium.]** *Trav. Sta. Rech. Groenendael* (*Sér. C*) No. 9/10, 1944 [1947?] (5–7). 7 refs. [F.f.flem.]

The author gives the present distribution in Belgium of three enemies of Douglas Fir (*Chermes cooleyi*, *Rhabdocline pseudotsugae* and *Phaeocryptopus gäumanni*) and expresses fears for the future cultivation of this species.

[1418]. 44.3 : 12.26–8 : 12.21 (493). BOUDRU, M. *Crumenula abietina* Lag. sur les essences feuillues. **[*Crumenula abietina* on broadleaved species.]** *Trav. Sta. Rech. Groenendael* (*Sér. C*) No. 9/10, 1944 [1947]? (8–9). 3 refs. [F.flem.]

Gives a list of broadleaved species on the twigs of which *Crumenula abietina* has been found living as a saprophyte.

[1419]. 44.3 : 12.26–8 : 12.21. LARGE, J. R. **Canker of Tung trees caused by *Physalospora rhodina*.** *Phytopathology* 38 (5), 1948 (359–63). 10 refs.

[1420]. 44.3 : 12.26–8 : 12.21 (691). HEIM, R., and BOURIQUET, G. Une maladie chancreuse de l'*Aleurites* à Madagascar. **[A canker disease [*Septobasidium aleuritidis*] of *Aleurites* in Madagascar.]** *Revue de Pathologie végétale et d'Entomologie agricole de France* 27, 1948 (3–13). [F.] *Abstr.* in *Agron. trop.* 3 (5/6), 1948 (292–3).

[1421]. 44.3 : 12.26–8 : 12.21. BIRAGHI, A. Il cancro del castagno causato da *Endothia parasitica*. **[Chestnut canker caused by *Endothia parasitica*.]** *Repr.* from *L'Italia agricola* No. 7, 1946. pp. 9. [It.] X.

A general account of the disease, with description of the typical lesions and the mechanism of dispersal, and its spread in Italy since it was first recognized there in 1938. [Cf. *For. Abstr.* 9 (Nos. 1279, 2553).]

[1422]. 44.3 : 12.26–8 : 12.21. KELLEY, A. P. **Further studies on the continued growth of American Chestnut.** Landenberg Laboratory, Landenberg, Pa. 1948. pp. 6.

In a fresh survey of *Castanea dentata* on a number of plots previously studied [cf. *For. Abstr.* 8 (No. 2104)], the author found that seedlings growing in shade had made slow growth but appeared to be quite free of blight, while those in full sunlight were usually infected. Other points noted were the vigorous shoot growth on many diseased stumps and the number of healed cankers.

[1423]. 44.3 : 12.26–8 : 12.21 : 45.3 : 13.2. SPAULDING, P. **The role of *Nectria* in the Beech bark disease.** *J. For.* 46 (6), 1948 (449–53). 18 refs.

After giving a general account of the disease, the author reviews the European literature on the subject, discusses the relative responsibility of the Beech scale insect (*Cryptococcus fagi*) and the fungus (*Nectria coccinea* var. *faginata*) for the mortality of infected trees, and describes the spread of the disease in North America, also the occurrence of the fungus *Gonatorrhodiella highlei* parasitic on the *Nectria*, which appears only on colonies old enough to produce a profusion of fruiting bodies. This association of an insect and two

fungi in a serious disease of forest trees is believed to be unique.

[1424]. 44.3 : 12.26–8 : 12.21 (777). [DIETZ, S. M., and YOUNG, R. A.] **A study of the causal relationship and control of the Oak wilt fungus.** *Rep. Ia. agric. Exp. Sta.* 1947 (169).

A severe outbreak of Oak wilt (*Chalara quercina*) occurred in Iowa in 1946. Trees affected were mostly dominants; seedlings and immature trees in the same area were seldom attacked. Complete removal of dead trees, followed by early recognition and removal of these newly infected, checked the spread of the disease. Pruning of infected branches several feet behind the expressed symptoms was effective in controlling Oak wilt on individual White Oak trees.

[1425]. 44.3 : 12.26–8 : 12.21 (778). BRETZ, T. W., and TUCKER, C. M. **Canker stain of London Plane in St. Louis, Missouri.** *Plant Dis. Reptr.* 32 (2), 1948 (65–6). A.P.B.

Canker stain of *Platanus acerifolia*, caused by a species of *Endoconidiophora*, in a location remote from previously reported centres of infection.

[1426]. 44.3 : 12.26–8 : 12.21 : 13.2 (73) : 45.3 : 41. **Elm bark beetle conference committee report on DED control.** *Trees, Cleveland (Ohio)* 8 (3), 1948 (7–8, 18, 20).

A large part of this conference of forestry agencies of New England, the Federal Bureau of Entomology and Plant Quarantine, and the Canadian Dept. of Agriculture, was devoted to formal statements and discussions on the use of DDT to prevent bark-beetle feeding as a means of controlling the Dutch Elm disease. It was generally agreed that there is not yet sufficient information on the use of DDT to justify unqualified recommendations for its use in controlling the disease. Tests have, however, been made on many DDT formulations and on methods of application whereby DDT can be applied to Elm twigs to prevent crotch feeding by *Scolytus multistriatus*. To ensure adequate coverage, spray operators must use special DDT formulations and spraying techniques, and first-class apparatus. For application by hydraulic sprayer, the DDT emulsions so far tested appear to be more effective than solutions or suspensions. Three effective formulations are given. Mist blowers have been tested; they conserve DDT and seem to give better coverage, but their use increases operational time. Notes are given on precautions necessary in using DDT and its solvents.

[1427]. 44.3 : 12.26–8 : 12.21 : 13.2. PARKER, K. G., COLLINS, D. L., TYLER, L. J., CONNOLA, D. P., OZARD, W. E., and DIETRICH, H. **The Dutch Elm disease: association of *Ceratostomella ulmi* with *Scolytus multistriatus*, its advance into new areas, method of determining its distribution and control of the disease.** *Mem. Cornell agric. Exp. Sta.* No. 275, 1947. pp. 44. 36 refs.

A review of the literature and a report on field and laboratory studies made by the authors in the Hudson River valley. The following facts were established:—(1) *Ceratostomella ulmi* is generally prevalent on *Scolytus multistriatus* adults in the lower and central Hudson River valley. (2) Only a very small number of destructive infections resulted, in proportion to the total number of feeding scars on twigs made by inoculum-bearing beetles. (3) The disease is often not maintained locally; that is, new infections do not always occur from inoculations by beetles emerging from infected trees. On the other hand, a number of small sources scattered over a large area are likely to produce infections within the area.

Evidence is presented which indicates that the Dutch Elm disease pathogen is carried into new areas by *S. multistriatus* in connexion with its breeding activities. This conclusion is based on two facts:—(*a*) Infected trees on the advancing periphery of the area of disease are usually associated with previous beetle emergence from dead Elm wood not killed by the disease. (*b*) Cultures of beetles emerging from dead Elm material collected beyond the area of disease incidence have yielded the fungus before any infected trees could be found.

Culture of frass, bark, or wood tissue taken from larval galleries were quite as successful for the determination of presence of the fungus as were cultures of beetles; frass in particular is much easier to handle. This method is recommended for making surveys for the presence of the pathogen in areas where the disease is not known or for determining its degree of prevalence in disease areas.

A preliminary report is presented of a study of a local control programme based on bark-beetle sanitation measures. [Cf. *For. Abstr.* 9 (No. 2564).]

Experimental evidence, previously presented by the writers and others, is cited which suggests that inoculations by the second or late summer brood beetles are relatively unimportant.

[1428]. 44.3 : 12.26–8 : 12.21 (747) : 13.2. PARKER, K. G., HAGMANN, L. E., COLLINS, D. L., TYLER, L. J., DIETRICH, H., and OZARD, W. E. **The association of *Hylurgopinus rufipes* with the Dutch Elm disease pathogen.** *J. agric. Res.* 76 (7/8), 1948 (175–83). 15 refs. O.R.E.

Culture studies and field observations indicate that the bark-beetle *Hylurgopinus rufipes* may carry the Dutch Elm disease pathogen, for *Ceratostomella ulmi* was obtained from beetles emerging both from infected wood and from Elm branches cut or broken from non-diseased trees. It is thought that the fungus may persist on hibernating adults and that breeding activities may introduce the fungus into new areas. Methods of inoculation by *H. rufipes* and their possible influence are discussed. In spite of the fact that the material studied yielded proportionally as much fungus as that found in association with *Scolytus multistriatus*, the incidence of Dutch Elm disease is low in the area N.E. of Windson, N.Y., where *S. multistriatus* is absent and *H. rufipes* is present. This is undoubtedly due to 2 facts:—(1) egg-laying trial tunnels in branches are usually made with insufficient vigour for the fungus to invade the healthier parts of the tree, (2) wood injuries made in connexion with hibernation and feeding activities are not frequent enough, or are made at the wrong time of the year to cause many infections.

45. DAMAGE BY ANIMALS

45.1. *Mammals*

See also *For. Abstr.* 10 (Nos. 964, 1022).

[1429]. 45.12 : 12.25 : 13.2 : 23.23.11. ROE, E. I. **Effect of red squirrels on Red Pine seed production in off years.** *J. For.* 46 (7), 1948 (528–9). 3 refs.

Heavy cone crops of *Pinus resinosa* are borne at 3- to 7-year intervals, with light crops or failures in between. It is suggested that the light crops may be, to a large extent, the result of squirrel damage in the previous year. During a period of 2 weeks in September, 1946, cones were collected from an isolated Red Pine of about 20 in. d.b.h. These were all picked up from the ground, still attached to short branch tips which had been cut off by red squirrels. About 1·2 bushels were collected, which appeared to make up the total production for the year, and it was observed that the branchlets also bore a number of one-year cones. It is calculated that in this way the squirrels, while cutting down the 1946 crop, also destroyed a potential crop of half a bushel. Since no mature cones could be found on this tree in 1947, there is no doubt that the squirrels turned the possibility of a fair cone crop into a failure.

[1430]. 45.12 : 13.2 (776) : 42.31. VESALL, D. B., NYMAN, R. W., and GENSCH, R. H. **The relation of beaver to swamp timber management in Koochiching County, Minnesota.** *Proc. Soc. Amer. For. 1947*, 1948 (195–200). 1 ref.

A study was undertaken to determine the extent of the damage by flooding to swamp-type coniferous forest land adjacent to drainage ditches colonized by beavers. An average of 29 acres of 358 cords of flood-damaged timber was observed per mile of ditch. A beaver population of 3·2 per mile, or one active colony per 1·3 miles was found on the same ditches. It is concluded that a greater return can be obtained from such land by concentrating on timber production than by attempting to combine it with trapping.

45.3. *Insects*

See also *For. Abstr.* 10 (Nos. 957–63, 968, 1030, 1247, 1417, 1423, 1426–8).

[1431]. 45.3 (71). **Noxious forest insects and their control.** *Repr.* from *Canada Year Book 1947*, 1947. pp. 14 + 6 drawings, 1 map. P.R.

Describes with illustrations some insect pests common in Canada, gives maps showing fluctuations of Spruce budworm outbreaks in Eastern Canada 1909–44, and discusses methods of control.

[1432]. 45.3 (711). RICHMOND, H. A. **Forest insect problems in British Columbia.** *B.C. Lumberm.* 32 (5), 1948 (58–9, 74, 76).

[1433]. 45.3 : 07.7 : 44.3. PIRONE, P. P. **New type of tree sprayer at the garden.** *J. N.Y. bot, Gdn.* 49 (582), 1948 (144–5).

Describes a jet-air tractor sprayer, displayed at the New York Botanical Garden, which can shoot a fine cloud of dust or spray over the tops of 100-ft. trees. An air current with velocity up to 150 m.p.h. is used to propel the liquid or dust, and one ½ to 12 gal. of spray per acre is needed, compared with 100 to 1,200 gal. in the conventional hydraulic sprayer. A smaller machine delivers an air current to propel insecticides at the rate of 8,000 cu. ft. per min., a larger one at the rate of 16,000 cu. ft. per min.

[1434]. 45.3 : 07.7 : 41. LAPEYRONIE, A. Traitements antiparasitaires par avion ou par hélicoptère. **[The application of insecticidal dusts and powders from aeroplanes or helicopters.]** *Agron. trop.* 3 (5/6), 1948 (227–45). 42 refs. [F.]

The author made a survey of the subject for the purpose of advising on the practicability of aerial dusting of Coffee and Quinine plantations in Cameroun. He briefly reviews experiments and practice in the U.S.A., Germany and France, and discusses in some detail the distributory apparatus, insecticides, the technique of application, meteorological factors, etc.

[1435]. 45.3 : 41 : 91.1. RIPPER, W. E., GREENSLADE, R. M., HEATH, J., and BARKER, K. **New formulation of DDT with selective properties.** *Nature, Lond.* 161 (4091), 1948 (484). [Pest Control Ltd., Harston, Cambridge.]

Formulations of DDT were prepared in which the individual particles of DDT were coated with degraded cellulose by an acid precipitation of the degraded cellulose from alkaline solution to which a DDT suspension had been added. These preparations were then sprayed on to leaves or other surfaces, and test insects were allowed to come into contact with them when dry, in order to see whether the coating would protect carnivorous insects such as flies, bees and parasitic Hymenoptera, which cannot digest cellulose, from the effects of DDT. Comparing residual films of coated DDT and standard DDT suspension, both at 0·0157 mg. DDT per sq. cm., it was found that, with the former, the following DDT-suspectible insects were either not killed, or their mortality was significantly reduced:—*Lucilia sericata* (adults), *Syrphus* spp. (adults), *Apanteles glomeratus*, *Apis mellifera*, *Mormoniella vitripennis*. The same material sprayed at the same rate on leaves which were then fed to larvae of *Pieris brassicae*, *P. rapae* and *Tortrix pronubana* gave mortalities approaching those obtained with normal, uncoated DDT suspensions. This development should prove useful in avoiding certain undesirable results of DDT spraying, which are of considerable economic importance, such as outbreaks of other species of insect hitherto controlled by their natural enemies, or the rapid rebuilding of infestations of pests which are controlled by DDT but are able to re-establish themselves because of the simultaneous destruction of their natural enemies.

[1436]. 45.3 : 41. DUSTAN, G. G., ARMSTRONG, T., and PUTMAN, W. L. **The influence of air currents on the insecticidal action of DDT, benzene hexachloride, Hercules Toxicant 3956, and Velsicol 1068.** *Canad. Ent.* 79 (3), 1947 (45–50). 1 ref. O.R.S.

Exposure to air currents greatly reduced the effectiveness of those insecticides having pronounced fumigant action, namely benzene hexachloride and Velsicol 1068, caused some reduction in effectiveness of Hercules Toxicant 3956, which has less fumigant effect, and had no influence on the toxicity of DDT, which is without fumigant action. *Authors' summary.*

[1437]. 45.3 : 13.12 : 12.21. MACLEOD, D. M. **Fungi and forest insects.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada* 4 (3), 1948 (2).

A preliminary study of fungi in the biological control of forest insects has demonstrated that fungi are invariably present or associated with diseased or dead specimens. A number of these, however, are believed to be secondary, having established a saprophytic relationship after the death of the insect. Others may be weak parasites dependent on a special stage or weakened condition of the insect for their infection and propagation. The fungi so far isolated belong to the Fungi Imperfecti. Organisms found on the Spruce budworm include *Beauveria* spp. *Isaria* spp., *Fusarium* spp. and *Acromonium* sp.; on the Larch sawfly, *Isaria* spp. and *Fusarium* spp., and on the hibernating larvae of the Maple leaf cutter, *Beauveria* spp. and *Fusarium* spp.

[1438]. 45.3 : 13.2 : 12.25 (497.2). STEFANOV, D. Masovi nasekomni napadenija v našite borovi gori. **[Mass insect attacks in our Pine forests.]** *Gorsko Stopanstvo* 2 (1), 1946 (43–6). [Bulg.]

The heavy snow breakage of 1943 and the exceptional drought of 1945 have caused an insect epidemic in the young Pine (*P. sylvestris*) forests of Bulgaria, particularly in the Rila-Rhodope region. Most active are *Ips acuminatus*, *Pityogenes bidentatus* and also *Myelophilus piniperda* and *M. minor*. The author stresses the urgency of control measures, including the removal, at whatever cost, of all infested trees; special grants and decentralized control will be necessary.

[1439]. 45.3 : 13.2 : 42.32 : 12.25 (437). GALOUX, A. Les multiplications d'insectes après les bris de neige dans les forêts résineuses. **[The multiplication of insects after snow breakage in coniferous forests.]** *Bull. Soc. for. Belg.* 54 (12), 1947 (433–49). 13 refs. [F.f.]

The frequent occurrence of snow breakage in the coniferous forests of the Sudetenland is one of the great problems of Czech forestry. The damage thus caused is followed by great increases in insect populations. In Spruce stands, *Hylurgops palliatus* rapidly invades all dying stems. After about 2 years, populations of *Pityogenes chalcographus* build up to dangerous proportions. Damage by *Ips typographus*, the most serious of all, appears later still. *Polygraphus polygraphus* attacks medium-sized Spruce. *Dendroctonus micans* and *Callidium luridum* are of lesser importance. *Xyloterus lineatus*, which attacks freshly felled logs and cordwood and does serious damage to them, also increases after snow damage. The succession of population peaks in time, and the distribution of different species of Scolytidae in Spruce stands of different ages and on different parts of the tree are shown in tabular and graphic form. In Pine forests, populations of *Myelophilus* spp., *Pissodes piniphilus* and *Pityogenes bidentatus* increase considerably. It is concluded that the sudden onset of new ecological conditions for trees isolated by snow breakage causes physiological disturbances, more or less serious according to the species, which render them specially vulnerable to attack by various insects which build up their populations over a period of years. *From author's summary.*

[1440]. 45.3: 13.2 : 41. GALOUX, A. Le contrôle des Scolytides. **[The control of Scolytidae.]** *Bull. Soc. for. Belg.* 55 (2), 1948 (61–71). 9 refs. [F.f.]

After some remarks on the multiplication of Scolytidae, the author examines the general principles of control. It is shown that, following severe damage (e.g. from wind-throw or snow breakage) in a forest, insect pullulations increase to a point where they cause severe damage and loss, but that it takes a period of 1½–2 years for them to reach this point. The essential condition of successful and economical control is to time the appropriate measures so as to do the maximum destruction while the population is still in the building-up stage. Methods of determining the stage of development by calculating the coefficient of multiplication are illustrated for *Ips typographus* and *Pityogenes chalcographus*. The preparation and operation of trap trees is described.

[1441]. 45.3 : 12.25 : 13.2 (410). **The Spruce bark beetle.** *Leafl. For. Comm., Lond.* No. 26, 1948. pp. 8.

A general account of the more important species of the genus *Ips*, recent European outbreaks, and means of control. The primary object of the leaflet is to enable British foresters readily to identify *I. typographus*, whose introduction on timber from Germany is a danger.

[1442]. 45.3 : 12.25 : 13.2 (493). GALOUX, A. Le bostryche typographe (*Ips typographus* Linné). **[The engraver beetle (*Ips typographus* L.).]** *Bull. Soc. for. Belg.* 55 (6), 1948 (202–6 + 4 drawings). 5 refs. [F.]

Ips typographus has recently appeared in the Spruce forests of the Ardennes, following the exceptional drought of 1947. The biology, habits and means of control of this pest are briefly described.

[1443]. 45.3 : 12.25 : 13.2. GALOUX, A. Biologie et importance forestière du scolytide *Pityogenes chalcographus* L. **[Biology and silvicultural importance of the bark-beetle *Pityogenes chalcographus*.]** *Bull. Soc. for. Belg.* 55 (7), 1948 (225–37). 35 refs. [F.]

[1444]. 45.3 : 12.25 : 13.2 : 13.15. GALOUX, A. Note sur la biologie de *Pachyceras xylophagorum* Ratzeburg (Hymenoptera Chalcididae). **[Note on the biology of *Pachyceras xylophagorum* Ratzeburg.]** *Commun. Sta.*

Rech. Groenendael (*Sér. C*) No. 7, 1947. pp. 10. 19 refs. [F.f.flem.]

The author reviews the geographical distribution and hosts of the Chalcid *Pachyceras xylophagorum* from the literature, and reports some observations of its parasitism on *Pityogenes chalcographus*.

[1445]. 45.3 : 12.25 : 13.2 : 13.15. FRONK, W. D. **The Southern Pine beetle. Its life history.** *Technical Bulletin, Virginia Agricultural Experiment Station* No. 108, 1947. pp. 12.

Field and laboratory studies on *Dendroctonus frontalis* are described. The average life period is 47 days. It is calculated that there were 4 generations and a partial 5th during the year of study. When subjected to temperatures of 0° F. for a short time, most insects died. Experiments in drying infested logs showed that the greatest number of adults emerged when the moisture loss was between 19 and 28%. [Cf. *For. Abstr.* 3 (253).]

[1446]. 45.3 : 12.25 : 13.2 : 52.1. HOPPING, G. R., and BEALL, G. **The relation of diameter of Lodgepole Pine to incidence of attack by the bark beetle *Dendroctonus monticolae* Hopkins.** *For. Chron.* 24 (2), 1948 (141–5).

In 1943, during an outbreak of Mountain Pine bark-beetle in Lodgepole Pine in Banff National Park, Alberta, a study was carried out to determine any correlation between tree diameter and the incidence of attack. It was found that there was a rise of 4–5% infestation with each inch of tree diameter, starting at about 6 in., below which infestation is very rare. This correlation may provide a convenient index to bark-beetle hazard in managing Lodgepole Pine forests.

[1447]. 45.3 : 12.25 : 13.2 (711) : 13.15. HOPPING, G. R. **Notes on the seasonal development of *Medetera aldrichii* Wheeler (Diptera, Dolichopodidae) as a predator of the Douglas Fir bark-beetle, *Dendroctonus pseudotsugae* Hopkins.** *Canad. Ent.* 79 (7/8), 1947 (150–3). [Division of Entomology, Department of Agriculture, Ottawa.] O.R.S.

Log analyses show that the larval population of *Medetera aldrichii* sometimes averages 10 per sq. ft. of log surface, while bark-beetle populations vary from 23 to 63 per sq. ft. There is evidence to show that each *M. aldrichii* larva destroys several bark-beetle larvae during its development. The eggs of *M. aldrichii* are laid in crevices of the bark between mid-June and early August. Eggs hatch in about 9 days. Larvae winter in the trees and pupate during late April and in May of the following year. Over 1,200 larvae are sometimes present in one tree. The pupal period lasts about one month. Only one other predator, *Enoclerus sphegeus* seems to be as effective. *From author's summary.*

[1448]. 45.3 : 12.25 : 13.2 (410). WILSON, G. F. **Two injurious aphid pests of conifers.** *J.R. hort. Soc.* 73 (3), 1948 (73–8). 14 refs. O.B.D.

A short account of the Spruce aphis (*Neomyzaphis* (*Myzaphis*) *abietina*) and the Cypress aphis (*Neochmosis* (*Panimerus*) *cupressi*)—distribution, biological description and symptoms of attack. Spring, summer and autumn attacks are successfully controlled by a nicotine dust applied at air temperatures above 65° F.

[1449]. 45.3 : 12.25 : 13.2 : 22.1. **The Green River project for the study of forest management in relation to Spruce budworm control.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 980 (F–3), 1948. pp. 5. 6 refs.

A report on the history of the project, the methods of the investigation, and the progress to date. [Cf. *For. Abstr.* 8 (Nos. 2123–4).]

[1450]. 45.3 : 12.25 : 13.2. GEORGE, J. L., and MITCHELL, R. T. **Calculations on the extent of Spruce budworm control by insectivorous birds.** *J. For.* 46 (6), 1948 (454–5). 2 refs.

During studies made in June–July, 1946, to determine the effect of feeding nestling birds on DDT-killed larvae of the Spruce budworm, some information was gathered on the probable degree of control of the Spruce budworm by birds. It was found that in this region of New York, where adult insectivorous birds averaged 2½ pairs per acre and the budworm population from ½ to 1 million per acre, the degree of control by birds is only 3·5–7%, not taking into account the number of eggs and 1st and 2nd instar larvae consumed by birds during the rest of the year. Other estimates are quoted, and it is concluded that though birds cannot control a heavy outbreak, they could play an important

part in preventing the insect from building up heavy populations. [Cf. *For. Abstr.* 10 (No. 963).]

[1451]. 45.3 : 12.25 : 13.2 (71). LEJEUNE, R. R. **Status of the Larch sawfly, *Pristiphora erichsonii* Htg. in the Prairie provinces.** *Canad. Ent.* 79 (7/8), 1947 (130–4). 16 refs. [Division of Entomology, Department of Agriculture, Ottawa.] O.R.S.

A brief survey of the present Larch sawfly outbreak in the Canadian Prairie provinces, where young stands of immature Tamarack in swampy areas have been attacked. In spite of the early success of the European parasite, *Mesoleius aulicus*, biological control has not come up to expectations. Recent studies show that only about 10% of *M. aulicus* survive to kill the host. A parasite fly *Bessa harveyi* has become well established but has not spread far from liberation centres. Mice and shrews at present destroy more cocoons than the parasites. Preliminary studies in chemical control have consisted of small-scale ground experiments with DDT and benzene hexachloride (666), which, at rates of ½, 1, and 2 lb. per acre gave excellent results. DDT retained greater killing power than benzene hexachloride after a period of 3 weeks. The regulation of water levels in swamps, in order to kill cocoons by submergence, is also being investigated. Where flooding is not possible, it is thought that draining might successfully encourage small predatory animals.

[1452]. 45.3 : 12.25 : 13.2 (71) : 13.15. HAWBOLDT, L. S. ***Bessa selecta* (Meigen) (Diptera: Tachinidae) as a parasite of *Gilpinia hercyniae* (Hartig) (Hymenoptera: Diprionidae).** *Canad. Ent.* 79 (5), 1947 (84–104). 37 refs. O.R.S.

A description and life history of *Bessa selecta*. The author considers that *B. selecta* cannot exert any material control over Spruce sawfly because its efficiency as a parasite is hindered by the following factors:—(1) sloughing of eggs, (2) mortality in the egg of embryologically developed maggots, (3) dislodging of first-instar maggots before entry through host integument, (4) sloughing of young maggots during host ecdysis, (5) superparasitism, (6) imprisonment of first-instar maggots in the sclerotized sheath, (7) mortality of adults in host cocoon, due to occasional inadequate preparation of the cocoon by the mature maggot for adult emergence. *From author's summary.*

[1453]. 45.3 : 12.25 : 13.2 (410). BENSON, R. B. **An additional European Spruce sawfly (Hym., Tenthredinidae) distinguished from *Pristiphora ambigua* (Fallén) and occurring in Britain.** *Ent. mon. Mag.* 84 (103), 1948 (162–3).

[1454]. 45.3 : 12.25 : 13.2 (71). LEJEUNE, R. R., and TURNOCK, W. J. **Pitch nodule maker [*Parharmonia pini*] causes serious damage in Pine plantations.** *Bi-m. Progr. Rep. For. Insect Invest. Dep. Agric. Canada* 4 (3), 1948 (2).

[1455]. 45.3 : 12.25 : 13.2 (789 : 791). MCKENZIE, H. L., GILL, L. S., and ELLIS, D. E. **The Prescott scale (*Matsucoccus vexillorum*) and associated organisms that cause flagging injury to Ponderosa Pine in the Southwest.** *J. agric. Res.* 76 (2), 1948 (33–51). 4 refs. O.R.E.

Gives the results of an investigation into 'flagging' of Ponderosa Pine in certain southwestern states of the U.S.A. The twigs of affected trees show a characteristic 'flag' and exhibit lesions which are readily detected by the presence of necrotic bark. Experiments in artificial infestation with *Matsucoccus vexillorum* and pathological analyses of infested twigs indicate that this scale insect is the primary cause of the blight. Heavy flagging appears only in areas where the insect is abundant, though infested twigs frequently develop no lesions. Eleven fungi and several bacteria occur fairly often on infected twigs, the most commonly associated fungus being one morphologically similar to *Cenangium ferruginosum*. Inoculations with these bacteria and fungi, however, indicate that none of them are sufficiently parasitic to cause flagging independently. Many lesions are arrested by the formation of a pathological cork cambium, which walls off the necrotic tissue before a lethal girdle can be effected. The intensity of flagging in infested areas varies widely from year to year, and it is possible that, during epidemic years, the scale population of an area becomes drastically reduced, and may need several seasons to build up to the point where damage again becomes conspicuous. There is no indication that the blight will in any way

endanger the U.S.A. Pine forests, for mortality is insignificant, occurring primarily among seedlings and saplings. [Cf. *For. Abstr.* 6 (116).] *From authors' summary.*

[1456]. 45.3 : 12.26–8 : 13.2. GRISON, P. Le pou de San José. **[The San José scale.]** *Bull. Soc. for. Belg.* 55 (8), 1948 (310–15). [F.]

Account of the biology, distribution, habits and control of *Aspidiotus perniciosus*, introduced into France about 10 years ago.

[1457]. 45.3 : 12.26–8 : 13.2 (73). BAERG, W. J. **The biology of the Maple leaf scale [*Pulvinaria acericola*].** *Bull. Ark. agric. Exp. Sta.* No. 470, 1947. pp. 14. 15 refs.

[1458]. 45.3 : 12.26–8 : 13.2. LEWIS, I. F., and WALTON, L. **Initiation of the cone gall of Witch Hazel.** *Science* 106 (2757), 1947 (419–20). 1 ref. D.S.I.R.

Describes the process of development of cone galls on Witch Hazel (*Hamamelis virginiana*). A substance initiating, stimulating and directing development and differentiation in the cone-gall cells is injected into the young leaf by 'stings' of the aphid, *Hormaphis hamamelidis*, which feeds on the neoplasm induced by its presence. Cells receiving the injection de-differentiate, undergo rapid mitotic divisions and redifferentiate, not into normal leaf cells, but into those of different tissues which organize the gall. The behaviour of the material when injected directly into the cytoplasm and when injected into intercellular spaces is described.

[1459]. 45.3 : 12.26–8 : 13.2 (674). LEPESME, P. Une cicadelle [*Ptyelus flavescens*] nuisible aux *Eucalyptus* en Oubangi-Chari. **[Damage by *Ptyelus flavescens* to *Eucalyptus* species in Oubangi-Chari.]** *Rev. int. Bot. appl. Agric. trop.* 27 (293/4), 1947 (162–3). 8 refs. [F.] P.R.

[1460]. 45.3 : 12.26–8 : 13.2 (748) : 07.7. HORST, M. **Saving Pennsylvania forests from their No. 1 insect pest.** *For. Leaves* 38 (2), 1948 (5–6).

A short summary of gypsy moth [*Lymantria dispar*] control measures in Pennsylvania. A spraying target of 150,000 acres has been set for 1948, and its achievement will be aided by the use of a converted Army C–47 twin motored monoplane, which has been equipped to spray 120 acres per minute of flying time, with a swath 500 ft. wide.

[1461]. 45.3 : 12.29 : 13.2 (691). FRAPPA, C. Un parasite du cocotier dans la région nord-ouest de Madagascar. **[A pest [*Melittoma insulare*] of the Coconut Palm in north-west Madagascar.]** *Agron. trop.* 3 (5/6), 1948 (274–81). 12 refs. [F.]

45.4. *Other Animals*

[1462]. 45.4 : 12.25 : 13.2. ANDRÉ, M. Une nouvelle variété de l'*Eriophyes pini* (Nal.), parasite des cyprès dans le département du Var. **[A new variety of *Eriophyes pini*, parasitic on Cypress in the Département du Var.]** *Bulletin du Muséum national d'Histoire naturelle* 18 (6), 1946 (475–7). [F.] L.S.

[1463]. 45.4 : 12.26–8 : 13.2 (73). TARJAN, A. C. **The meadow nematode disease of Boxwood.** *Abstr.* in *Phytopathology* 38 (7), 1948 (577).

A virulent disease of Box has caused a serious decline of this plant in the eastern U.S.A. Examination of the root system reveals isolated lesions on entire rootlets which appear brownish-black, apparently as a result of attacks by the various meadow nematodes, *Pratylenchus* spp. The pathogen is migratory in habit and evacuates dead and almost dead roots. Continuous attack over a number of years causes proliferous lateral root formation above the points of attack, with eventual formation of a shallow, densely interwoven root system in the upper soil layers. Above ground, symptoms may include defoliation, 'stag-head', a sickly, stunted growth and various types of foliage discoloration. Symptoms of the disease are usually more pronounced during periods of drought or freezing.

47. INJURIES OF ALL KINDS TO INDIVIDUAL TREE SPECIES

See also *For. Abstr.* 10 (Nos. 953, 967–9, 1412).

[1464]. 47 : 12.25 : 42.5 : 11.47 : 11.43.1 : 23.22.1. ROTH, E. R., TOOLE, E. R., and HEPTING, G. H. **Nutritional aspects of the little-leaf disease of Pine.** *J. For.* 46 (8), 1948 (578–87). 5 refs.

Shortleaf Pine [*Pinus echinata*] with little-leaf disease show a marked deficiency of N and

Ca in the foliage and a somewhat lower Mn, Al and Cu content than healthy trees [cf. *For. Abstr.* 7 (No. 393)]. In extensive fertilizer experiments, only soil amendments with large amounts of inorganic N were effective against the disease. Nitrate or ammoniacal N, at rates exceeding 200 lb. of available N per acre, prevented the onset of little-leaf to a notable degree, and either checked the disease or induced noticeable improvement in diseased trees, but salts or combinations of salts of the following elements (applied to the soil, or as foliage sprays, or both) had no beneficial effect: Na, P, K, S, Ca, Zn, Mg, Mn, Cu, Mo, Co, Ni, B and Fe. The rate at which trees became affected and their subsequent decline were hastened for the first few years by the addition of large quantities of hardwood or mixed Pine-and-hardwood leaf mould. Applications of salts of P, P + K, B, and dolomite, appeared to accelerate the decline; horse manure and compost had little effect over a 3-year period. Working of fertilizers into the soil was not helpful, and, when done with a mattock, proved definitely harmful. The disease seems to be associated with a failure to assimilate an adequate amount of N from the soil, for there was no N deficiency in many of the soils involved. The harmful effects of hardwood leaf litter or mould support this theory, since large applications of raw organic matter are known to induce temporary N starvation. It is highly probable that the failure to absorb enough N is due to faulty mycorrizhae and the killing of fine roots by soil fungi [cf. *For. Abstr.* 7 (No. 406)]. The accelerated decline in soil cultivated with a mattock is of interest in this connexion, since root injury was unavoidable during the process. *From authors' summary.*

[1465]. 47 : 12.26–8 (548.7) : 44.3 : 12.21. **[Die-back of *Casuarina* in Ceylon.]** *Administration Report of the Acting Director of Agriculture* [, *Ceylon*] *for 1946*, 1948 (9).

Die-back was investigated in a *Casuarina* plantation at Pallai. The affected trees were widely scattered, but incidence was highest where there was much undergrowth. The death of young plants was not associated with a fungus, but *Trichosporium vesiculosum* was found on most of the older dead and dying trees. It was concluded that the primary cause of death was lack of soil moisture in the dry season and waterlogging in the wet, and that the fungus is only secondary, entering the dead and dying roots and hastening the death of the tree.

[1466]. 47 : 12.26–8 : 24.51 : 11.47.13. MILLER, P. A. **Spring pruning and fertilizing of California Live Oak trees cause increase of tip mildew.** *California Agriculture* 1 (12), 1947 (4).

Fire-scorched trees of California Live Oak [*Quercus agrifolia*] in 2 areas burned over during the summer were severely attacked by tip mildew in the following spring and much of the new growth consisted of large witches' brooms. The transfer of seedlings from crowded flats or nursery rows to fertile soils in pots or in the field, also stimulates new growth, with a consequent increase of infection. Experimental work on possible control measures for this disease has been in progress since 1939. After 2 years' trial, spring pruning was abandoned as an aid to mildew control, the results having shown that the flush of growth following such pruning had an increased number of mildewed tips and of brooms. Application of N in the autumn had no adverse effect; application of ammonium sulphate in the spring resulted in an average of 15 more brooms per tree in treated trees than in controls. A similar group of trees which were at the same time pruned but not fertilized gave a roughly equal increase in brooming. It is recommended that pruning and fertilization of this species should be deferred till late summer or early autumn, when the weather is less favourable to the spread of the fungus and there is less young growth exposed to infection.

5. MENSURATION. INCREMENT. YIELD.

See also *For. Abstr.* 10 (No. 966).

52. MEASUREMENT OF TREES AND TIMBER

[1467]. 52 : 21.6 : 07.7. NASH, A. J. **The Nash scale for measuring tree crown widths.** *For. Chron.* 24 (2), 1948 (117–20).

The instrument has three main parts: main body, graduated arm and slides. Observations can be taken at distances from 50 to 100 ft. In the former the reading in the scale is divided by 2, in the latter it is read directly; for observations taken at a point between 50 and 100 ft.

the readings are proportional. An Abney level must be used in conjunction with the Nash scale, to obtain total height of tree and height above the observer's eye at which crown width is to be taken. Field experience by the Forest Air Survey Division of the Dominion Forest Service has proved the speed and accuracy of this instrument.

52.4. *Measurement of Volume*

See also *For. Abstr.* 10 (No. 1498).

[1468]. 52.42 : 12.26–8 (595). LANDON, F. H. **Mangrove volume tables.** *Malay. Forester* 11 (3), 1948 (117–20).

Discusses volume tables prepared for single trees of *Rhizophora conjugata* in Perak and Selangor. [Cf. *For. Abstr.* 3 (p. 86).]

[1469]. 52.43.2 : 31.23 : 12.25–9 (941) : 51 : 33.52 : 52.1. STOATE, T. N. **Cubic contents of logs and some associated tables.** For. Dep. W. Aust. 1946. pp. 70. P.R.

These tables, which are a revision and extension of those issued in 1920 and 1933, consist of: contents of logs in cubic feet; weights and strengths of Western Australian timbers; conversion of super. feet and parts to cubic feet; number of sleepers to the load of 50 cu. ft.; diameters with corresponding girths.

[1470]. 52.43.2 (44). CHAUDÉ, P., and DECESSE, E. Barème de cubage des bois en grume—établi conformément à la norme française B.53–015 de l'AFNOR, rendue obligatoire par arrêté du 17 avril, 1947. **[Volume tables for log-scaling—formulated according to French Standard B.53–015 of AFNOR, made compulsory by the decree of April 1947.]** Fédération Nationale du Bois, Paris. 2nd ed., 1947. pp. 276. [F.]

[1471]. 52.43.2 : 12.25 (489). NØRGAARD, K. Frijsenborgtabellen. **[The Frijsenborg table.]** *Dansk Skovforen. Tidsskr.* 33 (1), 1948 (1–20). 2 refs. [Dan.]

Discusses, in the light of subsequent investigations of its validity, the Frijsenborg table for Norway Spruce, in which the factors used to find the volume of logs are length and top diameter. Concludes that the original table is excessively favourable to the buyer, and presents a suggested revision.

[1472]. 52.43.3 : 12.26–8 (777). KELLOGG, L. F. **A volume table for Black Walnut trees in natural stands in Iowa.** *Sta. Note Cent. St. For. Exp. Sta.* No. 42, 1948. pp. [1].

[1473]. 52.43.6. BITTERLICH, W. Die Winkelzählmessung. **[Measurement [of basal area per ha.] by means of a tree diameter/spacing ratio.]** *Allg. Forst- u. Holzwirts. Ztg.* 58 (11/12), 1947 (94–6). [G.]

Detailed theoretical work (to be discussed in a later publication) and practical trials have enabled the author to devise a new method of measuring standing volume per ha. and its distribution by species. Presuming that only basal area per ha. has to be determined for each species present and that mean height will be assessed separately from trees estimated to represent the mean, the product of these values, multiplied by a form factor obtained from tables, gives volume per ha. Now basal area per ha. (G, in sq. m.), if the stand consisted of uniform stems of diameter d (cm.) and at a uniform triangular spacing of a (m.), can be shown to be $\left(\frac{d}{a}\right)^2$. 0·9. Even in non-uniform stands it will almost always be found that the dispersion diagrams for values of d and a show obvious clustering round definite mean values, and this will also be true of $\frac{d}{a}$, which can therefore be determined statistically from a fairly large series of individual records of the ratio $\left(\frac{dx}{ay}\right)$ = d.b.h. in cm./interval between trees in m., here termed the *Winkelzahl*.

This ratio is readily measured by means of a sighting device consisting of a 20-cm. scale calibrated in cm. (not numbered, but every 5th division thickened) and attached at right angles to a stick 1 m. long. The observer, standing by a given tree, applying the other end of the stick to the cheek, just below eye level, and holding the device horizontally and in the line of vision, takes a sighting on a neighbouring tree and reads off the *Winkelzahl* (ratio) directly from the scale. The reading is taken in whole cm.

Stands are cruised in roughly parallel strips, or in mountainous terrain along a serpentine course. At regular intervals of, say, 30–60 paces, the observer measures: (1) 'Basic readings' (*Grundmessungen*) taken from a given tree to the 4 nearest trees irrespective of species. These serve for the estimation of total basal

area per ha. (2) Fifteen to twenty 'catch readings' (*Fangmessungen*), taken in a circle about 3 times as large as for (1), which differentiate between species and are used to give the distribution of basal area thereby. Stems having less than $\frac{1}{2}$ the d.b.h. of the mean tree for any given species, are generally neglected. Measurement is very rapid if a second man records the data on a tally, a specimen of which is illustrated.

When the tally, which registers against each *Winkelzahl* from 1 to 20 the number of 'basic readings' in the first column and the number of 'catch readings' in as many successive columns as there are tree species, has been completed, basal areas are obtained as follows. (1) Counting back in the 'basic-readings' column to a position corresponding to one-half the total number of readings in that column, the exact mean *Winkelzahl* at this point $\left(\frac{d}{a}\right)$ is found by interpolation and basal area per ha. is obtained by squaring this figure and multiplying by 0·9. (2) In each 'catch-readings' column a similar procedure is followed, but counting back is done to the position representing 10% instead of 50% of the total readings per column. The value thus obtained, squared and multiplied by the total number of readings for the species, gives the proportional representation of that species by basal area. When this has been done for all 'catch-readings' columns, the values are summed and recalculated as decimal fractions of that sum. Examples are given of these calculations.

The method avoids any measurement of the area of the sampling sites.

[1474]. 52.46 : 22.83. BICKERSTAFF, A. **One-fifth acre versus one-tenth acre plots in sampling immature stands.** *Silv. Res. Note For. Serv. Can.* No. 83, 1947. pp. 11.

A study was made to determine whether $\frac{1}{5}$-acre plots were more suitable than $\frac{1}{10}$-acre plots in sampling immature mixed stands. Results indicated that: (1) to obtain averages of equal reliability, 1·6 times as many $\frac{1}{10}$-acre plots as $\frac{1}{5}$-acre plots are required; (2) for stem number distributions, $\frac{1}{5}$-acre plots were 27% less erratic than the smaller plots; (3) not more than 20% more time is required to lay out the larger plots. Since the increased accuracy of the $\frac{1}{5}$-acre plots is not likely to be accompanied by a proportionate increase in cost, it was recommended that where possible, $\frac{1}{5}$-acre plots be used in preference to $\frac{1}{10}$-acre plots for sampling by line plots. *From author's summary.*

[1475]. 52.46 : 61.32. BICKERSTAFF, A. **Sampling efficiency of line plot survey on Riding Mountain research area.** *Silv. Res. Note For. Serv. Can.* No. 84, 1947. pp. 11 + 1 map + 1 gph.

In 1939, a line-plot survey of the Riding Mountain Research Area sampled map subdivisions established previously on the basis of cover type and volume from aerial photographs. A statistical analysis of the line-plot data was made using basal area per acre as the criterion of comparison. The following points were brought out by the analysis: (*a*) The classes of cover and volume established from the aerial photographs differed appreciably in basal area (and, by inference, in volume) on the ground. (*b*) Within a given class of cover and volume, no significant differences existed between different map subdivisions. (*c*) To obtain a standard error of less than 10% of the estimated basal area for a given subdivision, at least 17 plots are required. (*d*) No practical advantage accrues from putting more than 30 plots in any given subdivision. (*e*) The number of plots required to sample a subdivision adequately does not depend primarily on its size. From 17 to 30 plots per subdivision, regardless of size, appears to be a suitable number for most work. (*f*) An index number expressing the homogeneity of the stand was assigned to each subdivision as a guide to future sampling; the higher the index number the greater will be the number of plots required to sample the subdivision. Consideration is being given to the possibility of assigning similar indices to subdivisions from aerial photographs as an aid to ground sampling. *Author's summary.*

53. SOLID CONTENTS OF STACKED MATERIALS

[1476]. 53 : 12.26–8. **[Bark thickness of Red Oak and Aspen.]** *Rep. Cent. St. For. Exp. Sta. 1947*, [1948] (26).

For *Quercus borealis* and *Populus tremuloides* in Iowa the relation of double-bark thickness at 17 ft. above ground level to that at breast height is linear only until double-bark thickness

at breast height reaches 1·5 in. Thereafter increase in bark thickness at b.h. is not accompanied by proportional increases at 17 ft. In Missouri, however, the Oak showed a linear relationship for all bark thicknesses. [See also *For. Abstr.* 10 (No. 1481).]

[1477]. 53 : 52.43.2. AARESTRUP FREDERIKSEN, J. Fastmassemaaling av Skoveffekter. II. **[Measurement of the solid volume of primary forest products. II.]** *Dansk Skovforen. Tidsskr.* 33 (3), 1948 (85–99). 1 ref. [Dan.]

Describes a new method of measuring half-clefts as segments of circles. As in the chord-and-radius method [see *For. Abstr.* 8 (No. 742)], Smalian's formula is the basis, but tables are constructed to give area of end section from length of chord and that of its perpendicular bisector. Neither in theoretical calculations nor in field checks was any important systematic error caused by using this method.

Half-cleft wood should be measured by the chord-and-perpendicular method unless the complement of the angle between the cleft faces exceeds 22½° (i.e. an estimated quarter of a right angle). In the latter case the end section is 'split' with a chalk mark and measured as two sectors by the chord-and-radius method, which is the appropriate method in general for wood cleft radially into 3 or more billets.

Tables are included for both of the new methods, which are suitable for measuring most cleft products except those of small dimensions.

55. AGE

[1478]. 55 : 12.25 : 21.63. MORRIS, R. F. **How old is a Balsam tree?** *For. Chron.* 24 (2), 1948 (106–10).

For the purpose of this investigation into the physiological age of Balsam Fir in virgin stands, the three indices taken were sexual maturity, the beginning of decadence as evidenced by butt rot, and the rate of growth at maturity. The results indicate that, for the area studied (upper Green River), the physiological age of Balsam trees is not influenced by the length of an initial period of suppression. Thus for many purposes, both in entomology and in forestry, the age since initial release is a more reliable criterion than the total age of the trees or stands.

56. INCREMENT

See also *For. Abstr.* 10 (Nos. 967, 979, 987, 1049, 1051, 1053, 1056).

[1479]. 56 : 21.6 : 12.26–8 : 12.11 : 12.14.6 : 31.2. BURGER, H. Holz, Blattmenge und Zuwachs. VIII. Mitteilung: Die Eiche. **[Wood, quantity of foliage and increment. VIII. Oak.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 25 (1), 1947 (211–79). 34 refs. [G.g.f.]

This study of (chiefly Pedunculate) Oak follows the same general lines as its predecessors dealing with other species [see *For. Abstr.* 1 (300–01); 2 (79); 3 (175); 4 (135); 5 (27) and 8 (No. 747)], and is based on data for 53 individual trees and many sample-plot observations. The results, which are shown in tables and graphs, relate to (1) *Wood properties*—specific gravity of heartwood and sapwood, green and dry; water content of living wood; shrinkage; bark diameter and its variations; sapwood volume; heartwood formation; and twisted grain. (2) *Crown and foliage in relation to increment in individual trees*—with data on weight of twigs; area and weight of foliage; crown projection, crown area and crown volume; and correlations of such factors with d.b.h. and stemwood increment by volume and weight. (3) *Crown and increment relationships in stands*—with data for a 13-year-old pure Oak plantation and a 65-year-old Oak/Beech wood. In the latter case values are given for both species concerned and an estimation is made of annual water consumption in transpiration.

[1480]. 56.02 : 11.21. HUBER, B. Über die Sicherheit jahrringchronologischer Datierung. **[The accuracy of dating by tree-ring analysis.]** *Repr.* from *Holz Roh- u. Werkstoff* 6 (10/12), 1943 (263–8). 6 refs. [G.] X.

[1481]. 56.02 : 53. FINCH, T. L. **Effect of bark growth in measurement of periodic growth of individual trees.** *Res. Note Nth. Rocky Mt. For. Range Exp. Sta.* No. 60, 1948. pp. 3.

The periodic change in bark thickness varies greatly with species. Data for 646 trees of 12 species in the Northern Rocky Mountains region were analysed for the purpose of determining average factors for converting present diameter outside bark, to past diameter outside bark. The method by which the factors were derived is set out. [See also *For. Abstr.* 10 (No. 1476).]

57. DEVELOPMENT AND STRUCTURE OF STANDS. YIELD

See also *For. Abstr.* 10 (Nos. 875, 967, 1018–20, 1049–51, 1055, 1248).

[1482]. 57 : 12.25–8 (748) : 56. FERREE, M. J. **Growth, cull, and mortality as factors in managing timber in the Anthracite region [of Pennsylvania].** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 15, 1948. pp. 21.

The data in the tables include 10-year diameter growth, 10-year volume increment in cu. ft., average 10-year diameter growth rates, cull factors, and 10-year mortality, all for trees growing in 3 types of natural stands, for 2 site qualities and 21 species. Their practical application for timberland owners is indicated in a series of average figures.

[1483]. 57 : 12.25 (772). DENUYL, D. **Some observations on White Pine (*Pinus strobus*) on Clark state forest.** *Abstr.* in *Proc. Indiana Acad. Sci. 1946*, 56, 1947 (35–6). A.P.B.

Studies of *Pinus strobus* plantations show that 25-year-old stands contain 400 trees per acre, ranging from 5 to 12 in. in diam. and from 30 to 60 ft. in height. Growth of the stands is approximately 1 cord per acre per year.

[1484]. 57 : 12.25 (485) : 22.89. NYBLOM, E. Planterad tallskog. **[Planted Scots Pine woods.]** *Skogen* 35 (12), 1948 (143–4). 1 ref. [Sw.]

Tabulates yield data for a 56-year-old Scots Pine plantation on the Näs estate, Hubbo, Västmanland, to supplement a previous article (in *Skogen* 1934) written with the aim of demonstrating the greater volume production in youth, faster diameter and height growth, and greater chance of good yields from thinnings in planted stands as compared with those derived from sowings or natural regeneration. Establishment costs must have been repaid by the first 3 thinnings, made at 29, 35 and 42 years of age. In the subsequent 14 years the stumpage value of thinnings has totalled Kr. 1,378 per ha. Total yield to date is 533 cu.m. over bark (standing volume) per ha., of which 287 cu.m. represents the growing stock after the last thinning.

[1485]. 57 : 12.26–8. ZEHNGRAFF, P. **Yields of Aspen in unmanaged stands.** *Tech. Notes Lake St. For. Exp. Sta.* No. 300, 1948. pp. [1].

A chart is given illustrating the gross, net and 'cull' volumes of Aspen trees down to 7 in. d.b.h., the measurements having been made in well stocked but unmanaged stands on an average site. Under 'cull' is grouped the entire volume of all 8-ft. logs left in the wood because of excessive rot, as well as the unsound timber in the merchantable logs. The dates show that Aspen reaches its peak productivity rather early in unmanaged stands.

[1486]. 57.9 : 12.26–8. KORSUŇ, F. Taxační tabulky pro akat. **[Yield tables for *Robinia pseudoacacia*.]** *Lesn. Práce* 26 (10), 1947 (305–22). 2 refs. [Cz.russ.] [Státní výzkumný ústav pro lesnickou ekonomii, Brno.]

Volume tables (*Akác-fatömeg táblák.* Sopron, 1935) and provisional yield tables for high forest and coppice (*Akác-fatermése táblák.* Sopron, 1937) have been published by Z. Fekete for *R. pseudoacacia* in Hungary. Korsun, having compared these tables and concluded that the division of the yield tables for high forest and coppice is unnecessary, has used the same data for the construction of provisional tables which ignore this distinction. Of the resulting tables published in the present paper the chief are those for mean height by quality classes, current increment of dominants, volume of dominants (all at 2-year intervals), mean annual increment of the dominants, volume of the dominated stand (at 5-year intervals, assuming a corresponding thinning cycle), and relation of crown density to crop density by quality classes.

6. MANAGEMENT. WORKING PLANS. SURVEYS

See also *For. Abstr.* 10 (No. 966).

60. GENERAL LAND MANAGEMENT

60.2. *Management of Tree Plantations under Non-forest Conditions*

[1487]. 60.2 (54) : 23.24. **Irrigated plantations.** *Proc. 6th silv. Conf., Dehra Dun 1945*, 1947 (135–52). Cf. *For. Abstr.* 7 (Nos. 2114–5), 6 (267).

[1488]. 60.2 (54). **Canal plantations.** *Proc. 6th silv. Conf., Dehra Dun 1945*, 1947 (162–73).

Five papers [cf. *For. Abstr.* 7 (No. 2113); 8 (No. 755)] and summary of debate.

[1489]. 60.2 (54) : 23.24. RANDHAWA, M. S. **Developing village India. Planting trees in villages.** *Indian Fmg.* Spec. No., 1946 (199–205). O.R.E.

Recommendations for tree plantations in an Indian village, with plans, and advice on species suitable for fuel, timber, fodder and fruit, planting methods, weeding, hoeing and irrigation.

[1490]. 60.2 (678). PITT, C. J. W. **Planning for fuel and pole plantations.** *E. Afr. agric. J.* 13 (4), 1948 (195–202). 3 refs.

An article intended to give a general idea of the forest management principles to be considered when planning an afforestation scheme of this nature, i.e. requirements, disposal and sale of products, working plan, finance, and, occasionally, adaptation of existing plantations.

60.3. *Management of Different Classes of Forest*

See also *For. Abstr.* 10 (No. 1504).

[1491]. 60.31.2 (747) : 33.0 : 35. COPE, J. A. **Trees and products of farm woodlands.** *Ext. Bull. Cornell Univ.* No. 722, 1948. pp. 39.

Contains general information on the species of New York State and on the kind and value of products obtainable from farm woodlands.

61. SURVEYING. MAPPING

See also *For. Abstr.* 10 (No. 1475).

[1492]. 61 (71) : 65 : 22.14. NICKERSON, D. E. **Silvicultural aspects of the Green River project.** *Pulp Paper Mag. Can.* 49 (7), 1948 (122, 124, 126).

Brief notes on methods of surveying and mapping large areas, keeping detailed inventories of smaller 'research blocks' and on experimental selection fellings.

[1493]. 61.3 (931) : 04.3. **New Zealand National Forest Survey standing field instructions.** [? N.Z. For. Serv.] [? 1947.] pp. 22.

[1494]. 61.31 : 67. COX, H. A. **Forest management: notes on surveying and the formulation of a working plan report.** *Wood* 8 (13), 1948 (236–7).

[1495]. 61.32. PARSONS, H. H. **Aerial sketching.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 985 (A–2–b), 1948. pp. 2.

The method described consists in sketching the location of forest types on base maps (usually 1 in.), from an elevation of 3,500–4,000 ft. The writer holds that, where different intensities of green denote not only age classes but different species, more information on forest types and classification can be obtained in this way by visual observation than by stereoscopic study of air photographs.

[1496]. 61.32. LOSEE, S. T. B. **Air survey of forest lands.** *Pulp Paper Mag. Can.* 49 (6), 1948 (98, 100).

Discusses the quality of photography called for, scale of maps, interpretation of photographs, and subsequent field work.

[1497]. 61.32. ROBINSON, J. M. **Tri-camera winter photography cuts forest inventory costs.** *J. For.* 46 (9), 1948 (643–5). Also in *Timber of Canada* 8 (11), 1948 (34–5, 74–5).

In recent experiments the Photographic Survey Company Ltd. have developed a tri-camera technique of winter aerial photography for forest areas, which is compared, to its advantage, with the usual summer verticals. Besides the saving in costs on account of the much greater area photographed from a single flight line, the flight altitude is so adjusted that prints are made on a scale of 800 ft. to 1 in., a scale ensuring great accuracy in interpretation and thus greatly reducing the number of ground checks, which further reduces costs.

There are also three distinct improvements over vertical methods in the matter of interpretation:—(1) *Improved identification of species.* With a winter oblique photograph, the profile outline of conifer trees helps the interpreter to obtain a more accurate and detailed species breakdown. The large-scale photography made possible by the tri-camera technique shows up the branch structure of deciduous species most definitely in winter photographs. Interpreters have found it possible in this way to distinguish, for instance, between Paper Birch and Aspen. Stands of Yellow Birch and Hard Maple also can be distinguished from Paper Birch and Aspen on the basis of height and size of crown.

(2) *Stand composition.* Hitherto, interpretation of air photographs has tended to underestimate the conifer element in mixed stands, since the hardwood crowns tend to overcrowd the conifers. With a snow background, the conifers stand out clearly and at the same time the complete bole and branches of the hardwoods can be readily distinguished.

(3) *Determination of tree heights.* A transparent oblique height grid [illustrated] has been developed, which, when laid over a photograph, enables an interpreter to take direct height readings without any computation. An additional grid is provided for use in determining the size of areas on oblique photographs.

[1498]. 61.32 : 52.43.3 (71). NASH, A. J. **Some volume tables for use in air survey.** *For. Chron.* 24 (1), 1948 (4–14).

Volume tables may be constructed and applied to scattered large softwood trees by making use of the formula $\frac{kh}{d_2} = E$. This formula is a development from a German formula $\frac{k}{d} = E$ (where k (*Krone*) = crown diameter), which was applicable to the managed forests of Germany. It was found that the original formula could not be used to calculate d.b.h. in the heterogeneous stands in Canada; therefore the ratio $\frac{h}{d}$ was incorporated by H. E. Seely of the Dominion Forest Service.

The original data were treated as a 3-variable problem which was accepted as a standard to which the following tree methods were compared:—

(1) Grouping the data by $\frac{kh}{d_2} = E$ in height classes.

(2) Making use of the diameter/height relation.

It was found that the 'formula method' compared very favourably with the standard 3-variable method and may be used as a basis for constructing volume tables.

The advantage of the $\frac{kh}{d_2} = E$ method is that the amount of field work necessary to produce a volume table will be very considerably reduced. Instead of taking 500 or more individual tree measurements, all that is needed is a sufficient number of measurements in each height group to establish the position of the $\frac{kh}{d_2}/Ht$ curve.

The tables have been based on 2-ft. crown diameter classes and 10-ft. height classes. The accuracy of measurements of tree images on winter photographs, such as were taken in the Riding Mountain National Park, is within the classes defined. *Author's summary.*

64. DESCRIPTION OF SITE. ASSESSMENT OF SITE AND STAND QUALITY

See also *For. Abstr.* 10 (No. 875).

[1499]. 64 : 11.41 : 11.34 : 12.25. COILE, T. S. **Relation of soil characteristics to site index of Loblolly and Shortleaf Pines in the Lower Piedmont region of North Carolina.** *Bull. Duke Sch. For.* No. 13, 1948. pp. 78. 42 refs.

A study was made of the relation between certain physical properties of soil, topographic-position classes, and the site index of *Pinus taeda* and *P. echinata*. Observations were made on 151 sample plots of either pure or mixed stands of these species. It was found that the site index of *P. taeda* was consistently and significantly higher than that of *P. echinata* in this locality. No significant differences in site index for either species could be attributed to topographic position (i.e. ridge, slope, lower slope and bottom) alone. The soil variables contributing to the site index of each species were:—

x_1 = thickness of the *A* horizon in inches.
x_2 = ratio of silt + clay to moisture equivalent of the *B* horizon.
x_4 = second power of x_2.
x_9 = imbibitional water value of the *B* horizon.

Soil variables which did not contribute significantly to site index were:—

x_3 = product of x_1 and x_2.
x_5 = product of x_1 and x_4.
x_6 = total depth to the *C* horizon in inches.
x_7 = product of x_2 and x_6.
x_8 = product of x_4 and x_6.

For practical purposes, estimates of site index on the basis of x_1 and x_9 alone appear to be almost as precise as with all 4 primary variables (x_1, x_2, x_4, and x_9). The following regressions

were derived on the basis of the two soil variables only:—

$$\text{(Loblolly) } Y = 100{\cdot}04 - \frac{75}{x_1} - 1{\cdot}39\,x_9.$$

$$\text{(Shortleaf) } Y = 77{\cdot}32 - \frac{45}{x_1} - 1{\cdot}00\,x_9.$$

[1500]. 64 : 12.25 (794). SOVULEWSKI, R., and HARRIS, T. H. **A method for the classification of Sugar Pine [*Pinus lambertiana*] land according to expected yield.** *J. For.* 46 (6), 1948 (432–7).

65. DESCRIPTION OF GROWING STOCK

See also *For. Abstr.* 10 (Nos. 1049, 1055).

[1501]. 65.7 : 66 : 24. MCINTYRE, A. C. **A report on 'The D/X spacing rule'.** *J. For.* 46 (7), 1948 (526–8).

The author, from sample-plot data, has worked out values of the factor X, for the Oak/Hickory, Virginia Pine, and Spruce/Balsam types, to be used in Mitchell's rule of thumb for regulation of farm woodlands (spacing between trees in feet should equal d.b.h. in inches plus X). The rule is designed to develop optimum spacing of reserved dominant and co-dominant trees. [Cf. *For. Abstr.* 5 (145).]

66. POSSIBILITY. SUSTAINED YIELD

[1502]. 66. SCHAEFFER, L. Vérification de possibilité. **[Calculation of the yield [with particular reference to irregular forests].]** *Schweiz. Z. Forstw.* 98 (12), 1947 (429–38). [F.g.]

Deals with some formulae for calculating the yield in cases where the only mensurational data available are those from a single survey. (1) Algan's volume tables, much used in France, are based on the hypothetical relationship

$$\frac{V_{d+5}}{V_d} = \frac{d}{d-10}$$

where d is d.b.h. in cm., V_d the volume of a tree having this diameter and V_{d+5} that of a tree of diameter $d + 5$. From a combination of this hypothesis with Pressler's formula it is possible to obtain the relationship $t = \frac{10}{kd}$ where t is increment %, and k = years taken to pass into the next higher diameter gradation $(d + 5)$. This method, being based on the average growing stock for the period, gives acceptable results when applied to areas where some years have elapsed since fellings were made, or to a complete series of areas of regularly graded cutting age. (2) The yield may be taken as roughly equivalent to the current annual increment. This method is preferable where fellings have just been made and the growing stock enumerated represents an initial value which will increase considerably before the next fellings. (3) The French method of 1883, which, owing to its elasticity, is particularly suited to forests of abnormal composition.

[1503]. 66 : 94.33 : 94.11 (711) : 95.1. GILMOUR, J. D. **Proposed sustained-yield units for British Columbia.** *Emp. For. Rev.* 27 (1), 1948 (52–9).

The author first describes the working of the proposed management licences or sustained yield units to be set up in British Columbia as a result of recent legislation; then analyses the management expenses, taxes, and other costs for a typical unit, which he finds impossibly heavy, and compares the scheme to its disadvantage with similar agreements being made in the Pacific Northwest of the U.S.A. [cf. *For. Abstr.* 9 (Nos. 1984–5)]. The B.C. licences eventually entail on the licensee the following costs in perpetuity (1) rent of 1% per acre per year on the whole productive area (his own and the Government land), (2) forest protection tax and forest management expenses on the whole area, (3) a yield tax of 16% of the appraised stumpage value when the timber is logged. The U.S. Forest Service, on the other hand, charges no rent to the co-operator, and itself meets all expenditure on fire protection and administration on its own lands; the co-operator pays full stumpage on timber logged from Government land. The U.S. co-operator also retains his original title to his own lands; he may pay an annual tax fixed in perpetuity and a yield tax of 12½% after logging, or, if he chooses, may pay the ordinary land tax, in which case he pays no yield tax. The writer suggests that the only equitable way of accomplishing management through the transition period is to offset all administrative and management expenses against stumpage payments. He emphasizes the fact that, contrary

to popular opinion, the climate of British Columbia is not pre-eminent in Canada for tree growth (S. Ontario, for example, almost matching it), that the second-growth timber produced in future will nowhere approach that of the virgin forests in size or quality, and that the distance of the province from its main markets is a serious handicap.

67. WORKING PLANS

See also *For. Abstr.* 10 (No. 1494).

[1504]. 67 (481) : 60.31.2. LUDVIGSEN, F. P. Driftsplanarbeidet for gårdsskoger. **[Working plans for farm woodlands.]** *Tidsskr. Skogbr.* 56 (1/2), 1948 (16–21). [Nor.]

Reviews broadly the main features in the collection of working-plan data (silvicultural, area, volume and increment data) as carried out at the instance of the Norwegian Forestry Society. Since 1942 some 480 plans have been compiled, work which has been subsidized by the Society to the extent of about Kr. 30,000 annually.

[1505]. 67 (485). SMITH, N. **Working plans of the Swedish state forests.** *Emp. For. Rev.* 27 (1), 1948 (48–51).

A brief account of the instructions for making working plans by the Board of Crown Lands and Forests (*Domänstyrelsen*) in Sweden.

7. FOREST ECONOMICS, VALUATION, AND FINANCE

See also *For. Abstr.* 10 (Nos. 966, 1049).

73. RATE OF INTEREST

[1506]. 73 : 12.25 (481). SEIP, H. K. Et forsøk på å gjøre viserprosenten tilgjengelig for praktisk bruk. **[An attempt to make the indicating per cent. accessible for practical use.]** *Tidsskr. Skogbr.* 56 (5/6), 1948 (117–30). [Nor.]

Basing his calculations on current price tables for Norway Spruce wood in Norway, the author presents and discusses tables giving, with what is thought to be sufficient accuracy for practical use, the values of various terms in the formula for the indicating per cent. The method of calculation is illustrated by an example.

76. MANAGEMENT STATISTICS

See also *For. Abstr.* 10 (Nos. 1013, 1015, 1019–20, 1050, 1164).

[1507]. 76 : 22.89 : 33.51 (493). JACQUEMIN, A. Considérations sur le prix des bois de mines. **[Considerations on the price of mining timber.]** *Bull. Soc. for. Belg.* 55 (3), 1948 (108–29). [F.]

Analyses in detail the costs of production and necessary price to give an economic return on expenditure, for three types of plantation in Belgium, and shows that prices at present ruling make the growing of mining timber uneconomic.

8. FOREST ADMINISTRATION

81. ORGANIZATION

[1508]. 81 (54). STEBBING, E. P. **The Indian Forest Service.** *Nature, Lond.* 162 (4108), 1948 (120–31).

A brief review of the service from its inception to the setting-up of the Dominions of India and Pakistan.

82. LABOUR QUESTIONS

See also *For. Abstr.* 10 (Nos. 855–6, 1027, 1061, 1142, 1146, 1151, 1165).

[1509]. 82 (71). **Seasonal variation of woods labour force.** *Woodl. Sect. Mem. Canad. Pulp Pap. Ass.* No. 27, 1948. pp. 1 + 1 gph.

The graph shows the number of men employed each week of the year in woods operations in Canada east of the Rockies. The seasonal character of the woods labour force is clearly indicated. The 1947–48 operations represented about 530,000 man months, which can be divided into 4 periods during which 4 phases of work were in progress:—

		Man months
Preparation	July, August	52,000
Cutting and skidding	Sept., Oct., Nov., Dec.	250,000
Hauling	Jan., Feb., March	156,000
Driving	April, May and June	72,000

9. FOREST POLICY

90. GENERAL PRINCIPLES OF FOREST POLICY

[1510]. 90 (45). DICKERMAN, M. B. **Forestry in post-war Italy.** *J. For.* 46 (6), 1948 (438–42). 10 refs.

[1511]. 90 (45) : 11.6 : 06.2. Ricostruzione agricola e forestale: Atti del primo convegno Emiliano-Romagnolo. **[Agricultural and forestry reconstruction: proceedings of the first conference for Emilia and Romagna.]** Ispettorato compartimentale del'agricoltura per l'Emilia. 1947. pp. 558. [It.]

Amongst the papers presented at this conference, were the following:—Timber consumption and damage to the forest resources of Emilia and Romagna (CARULLO); State intervention in the management of communal woodland in Emilia and Romagna (CANDELI); Forest hydraulic works in the province of Bologna in relation to reconstruction.

[1512]. 90 (54). HOWARD, SIR H. **India's forest organization [during the past 70–80 years].** *J. For.* 46 (8), 1948 (573–7). 1 ref.

[1513]. 90 (73) : 92. CHAPMAN, H. H. **Forest policies and laws [: an exposition of opposing and interacting interests in the U.S.A.].** *J. For.* 46 (8), 1948 (600–4).

91. SOCIAL AND ECONOMIC INFLUENCE OF THE FOREST. NATIONAL PARKS. RESERVES. FOREST INFLUENCES

[1514]. 91 : 97 (769). DUERR, W. A., *et al.* **Farms and forests of Eastern Kentucky in relation to population and income.** *Bull. Ky. agric. Exp. Sta.* 1947. pp. 56.

91.1. *Rural Preservation. Reserves. National Parks. Plant and Animal Protection*

See also *For. Abstr.* 10 (No. 1397).

[1515]. 91.1 : 34.3. JAMES, N. D. G. **Forestry and shooting.** *J. Land Agents' Soc.* 47 (6), 1948 (148–50).

The requirements of the keeper and the forester are compared and it is shown that they are not necessarily incompatible and have indeed much in common. The following measures to encourage pheasants and facilitate shooting are recommended:—(1) Provision of low cover by young plantations or natural regeneration, or by planting covert plants or underplanting with forest trees. (2) Provision of roosting places by leaving selected trees standing at the intersection of rides, etc. or by seed trees under a system of natural regeneration. Douglas Fir or Norway Spruce are probably the best species for the purpose. (3) Supplementing the food supply by planting shrubs whose fruit is attractive to pheasants, e.g. Oregon Grape (*Mahonia aquifolium*), Snowberry (*Symphoricarpus racemosus*), Dogwood (*Cornus* spp.), Raspberry (*Rubus idaeus*) and *Cotoneaster simonsii*. (4) The establishment of judiciously sited shelterbelts to protect both the edges of young plantations and the birds from wind. (5) Planting small clumps of trees or shrubs to act as flushing points during a drive. (6) A properly laid out system of rides. (7) Avoiding large areas of even-aged stands.

[1516]. 91.1 (595) : 05.3. **Annual report of the Game Department, Malayan Union, for the year 1947.** [?1948] pp. 25 + appendices.

The last complete report was compiled in respect of the year 1938, and this report is designed to bridge the gap. It includes a survey of the Department's origin and development, its eclipse during the Japanese occupation and subsequent reorganization. There are notes on the chief fauna and the promise shown by electric fencing. Appendices include a list of enactments for game preservation.

[1517]. 91.1 (778) : 34.3. HORNKOHL, L. W. **Turkey management on the national forests of Missouri.** *Proc. Soc. Amer. For. 1947*, 1948 (205–10). 13 refs.

[1518]. 91.1 (774) : 34.3. BARTLETT, I. H. **Cedar [*Thuja occidentalis*] swamp management and deer.** *Proc. Soc. Amer. For. 1947*, 1948 (210–4).

91.3. *Influence of the Forest on the Environment*

See *For. Abstr.* 10 (Nos. 881, 883, 893–4).

91.4. *The Forest in Hygiene and Recreation*

[1519]. 91.4 : 13.2 (6) : 13.15. ZUMPT, F. **Das Tsetseproblem. [The tsetse problem.]** *Mitt. Reichsinst. ausl. kolon. Forstwirt.* No. 8, 1944. pp. 9. 8 refs. [G.]

Discusses the hygienic and economic problems caused by the tsetse fly and some methods of control. Considers the question of erosion following complete clearance of vegetation and describes 2 successful methods of partial clearance in which only certain species of trees and bushes are removed or wide strips are completely cleared of vegetation, eradication of the tsetse in the intervening blocks being carried out by hand, by traps or by poison.

91.8. *The Forest as a Source of Employment and Income*

[1520]. 91.8 (73). POND, J. D. **So you want to be a consulting forester?** *J. For.* 46 (6), 1948 (426–31). 6 refs.

Account by a practising forestry consultant of the necessary qualifications for and the advantages of the profession.

92. FOREST LAW

See also *For. Abstr.* 10 (Nos. 1347–8, 1380, 1513).

[1521]. 92 (485). 1948 års skogsvårdslag. **[The Forest Conservation Law of 1948.]** *Skogsägaren* 24 (5), 1948 (87–93). [Sw.]

A new Forest Conservation Law was passed by the Swedish Parliament on April 21, 1948, and will come into force on January 1, 1949. The chief innovations, as compared with the Law of 1923 now in force, are: (1) The sphere of application has been extended to include all forests at present subject to the Lappmark Law of 1932 (which expires when the new law becomes effective) and certain others, chiefly town forests. (2) The guiding principle is that forest land and the forest thereon shall be so managed that a satisfactory economic yield is achieved and, so far as possible, no major fluctuations in yield occur. (3) In the clauses governing fellings the terms 'capable of development' (*utvecklingsbar*) and 'not capable of development' (*icke utvecklingsbar*) have been introduced. A forest is deemed 'capable of development' as long as it is judged more profitable, given proper management, to allow it to grow on than to fell it. Fellings other than thinnings are not permitted in this class of forest. As regards forest 'not capable of development', it is laid down that, in order to provide steady employment and a steady flow of raw materials to industries, fellings must not cause major fluctuations in outturn. Where fellings are made or planned in violation of these clauses, a ban on fellings may be imposed, normally for a maximum of 5 years, though the County Forestry Boards have power to prolong it for a further period of up to 5 years. Before proceeding to a legal ban on fellings, a County Forestry Board must try to come to an agreement with the owner on a suitable felling programme, so that a ban would be imposed only in exceptional cases. (4) If the condition of a forest is manifestly unsatisfactory, the owner can be required to take steps for its improvement, even though there may have been no neglect to provide for regeneration. Unless the owner receives a subsidy for such work, his responsibility is limited to costs covered by the value of trees that have to be felled in connexion with the improvement measures. (5) If so required by a County Forestry Board, an owner must take steps to prevent or restrict damage by insect pests. Subsidies from public funds may be granted to promote such measures.

It is pointed out that the law is not intended to be interpreted from its text alone but in conjunction with the principles set forth in the reports of the bodies which have seen it through Parliament. The moderating effect of these is illustrated, using the paragraph dealing with major fluctuations of outturn as an example, and it is claimed in this case that when all the appropriate matter has been read, little beyond a good intention remains.

[1522]. 92 (485) : 95.3 : 96.4. Lån och bidrag till skogsbruket: nya bestämmelser från och med den 1 juli. **[Loans and subsidies to forestry: new regulations with effect from July 1 [1948].]** *Skogsägaren* 24 (6), 1948 (113–4). [Sw.]

Under regulations taking effect from July 1, 1948, state subsidies for silvicultural work and drainage will be combined into a single fund, and the subsidies granted from this will be called 'state subsidies for forest improvement'. Kr. 350,000 have been earmarked for this purpose.

Subsidies will be payable only in respect of land coming under the new Forest Conservation Law or the Law regarding Communal Forests in Norrland and Dalecarlia. They may be paid for measures to improve unsatisfactory forest, irrespective of whether the owner is compelled to have the work done or has it done of his own accord. The normal amount of a subsidy will be 50% of that part of the cost of the measures which is not covered by the value of trees felled in connexion with the work. In cases where the work is undertaken voluntarily, 50% is taken as the maximum, and the body approving the grant has power to adjust it, within limits, to the owner's needs. In exceptional cases, e.g. where it is desired to relieve unemployment or where the owner would suffer hardship, the amount may be 60% of the costs as defined above. Grants are not limited to cases where legal compulsion might be used, e.g. a subsidy could be obtained for raising valuable hardwoods where the law could not specify what trees were to be grown. All categories of owners may apply for subsidies, though, if the demand should exceed funds, priority will be given to those most in need and able to make good use of the money. Measures against insect pests may be subsidized, whether undertaken voluntarily or under compulsion. In the former case the amount will be settled individually, but where the owner is compelled to do the work, the amount is to be at least 50% of the costs.

A new State Fund for Forest Credits also comes into existence on the same date. Loans may be made for silvicultural work on land subject to the same laws. They may amount to that part of the costs which is not met by subsidies or the value of timber felled on the land in question. Where loans are made for regeneration work, the value of the fellings giving rise to the need for regeneration is also to be deducted, except in special cases, e.g. where the felling was done by a previous owner. The total amount of loans to a single borrower may not exceed Kr. 10,000 in cases where the work is done voluntarily. All categories of owners are eligible for loans. For 1948–49, Kr. 500,000 have been set aside for the fund.

[1523]. 92 (82) : 35. D'Adamo, O. A. La Dirección Forestal Argentina y la provisión de materia prima a las industrias. [**The Argentine Forest Service and the provision of raw materials for industry.**] *Montes, Madrid* 4 (20), 1948 (145–9). [Span.]

A discussion of some points of the projected new Argentine Forest Law. This is intended to counteract the present over-centralization of forest industries by encouraging local undertakings. In order to prevent over-exploitation, the present system of giving felling permits for timber by tons or cu.m. is gradually to be replaced by leasing forest land by the ha. (according to the lessee's capacity) to be exploited subject to certain State restrictions.

94. FOREST OWNERSHIP

See also *For. Abstr.* 10 (No. 1503).

[1524]. 94.4 (73). **Forest co-operatives in the United States.** *Reappraisal Rep. U.S. For. Serv.* No. 6, 1947. pp. 18. 4 refs.

[1525]. 94.4 (755). Holsoe, T. **The co-operative association approach to the private forestry problem.** *J. For.* 46 (7), 1948 (511–3).

Gives some account of the working of the West Virginia Forest Products Association, a non-profit-making co-operative which manages about 100,000 acres of farm and other woodland. It is intended to meet the difficulty of the very small woodlot by using a readily transportable trailer mill which can be set up in about 1 hour and profitably moved from one small woodlot to another, sawing lumber for the farmers' use.

95. FOREST TAXATION, LOANS AND INSURANCE

See also *For. Abstr.* 10 (Nos. 1503, 1522).

[1526]. 95.1 (776). Allison, J. H. **Forest taxation.** Forest Industries, Information Committee, Univ. of Minnesota. 1946. pp. 10.

Discusses the taxation of forest land in Minnesota and makes suggestions for its reduction to a level at which owners of cut-over land will pay their taxes instead of forfeiting their land, as they often do at present.

96. POLICY REGARDING PROTECTION FOREST, DEFORESTATION AND AFFORESTATION

See also *For. Abstr.* 10 (Nos. 864, 869, 1522).

[1527]. 96.4 (481) : 35. Regler om utbetaling av tilskudd fra Investeringsfondet for Skogbruk. [**Rules for the payment of subsidies from the Forestry Investment Fund.**] *Tidsskr. Skogbr.* 56 (3/4), 1948 (94–6). [Nor.]

Forest owners in Norway who have sold specified kinds of timber at controlled prices during 1947–48 may claim a subsidy of Kr. 3 per cu.m. If the timber delivered to industry in that year should amount to 3·5 million cu.m., the subsidy will be raised to Kr. 4 per cu.m. The subsidies are to be used for improvements, e.g. roads, accommodation for workers, establishment of artificial pastures to relieve forest grazing, collection of working-plan data, cleanings and thinnings, and plantation costs so far as not directly subsidized. If it can be shown that no such need exists, the owner can claim to have the money paid direct, instead of through the local forestry authority.

[1528]. 96.5 : 11.62.1. CHAMPION, H. G. **Afforestation as a world problem.** *J. R. Soc. Arts* 96 (4771), 1948 (430–9).

97. POLICY REGARDING THE RELATION OF THE FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

See also *For. Abstr.* 10 (No. 1514).

[1529]. 97.3 (73). CARHART, A. H. **Our public lands in jeopardy.** *J. For.* 46 (6), 1948 (409–16).

A discussion of the current attack on U.S. soil conservationists by the grazing interests of the Middle West.

FORESTRY THE WORLD OVER

References: 1. *British Columbia Lumberman*, Vancouver. 2. *Bulletin de la Société centrale forestière de Belgique*, Brussels. 3. *C.P.P.A. News Bulletin*, Montreal. 4. *China Newsweek*, London. 5. *Crown Colonist*, London. 6. *Foreign Commerce Weekly*, Washington. 7. *India News*, London. 8. *Italia forestale e montana*, Florence. 9. *Maderil*, Buenos Aires. 10. *Allgemeine Forst- und Holzwirtschaftliche Zeitung*, Vienna. 11. *Nature*, London. 12. *New York Forester*, Albany, N.Y. 13. *Revue internationale du Bois*, Paris. 14. *Schweizerische Zeitschrift für Forstwesen*, Bern. 15. *Soil Conversation*, Washington. 16. *Southern Lumberman*, Nashville, Tenn. 17. *Tectona*, Buitenzorg. 18. *Timber and Plywood*, London. 19. *Timber News*, London. 20. *Timber of Canada*, Ottawa. 21. *Timber Trades Journal*, London. 22. *Timberman*, Portland, Ore. 23. *Trees*, Cleveland, Ohio. 24. *Unasylva*, Washington. 25. *Wood*, London.

The numbers in brackets indicate the reference number and date of publication of the periodicals, etc., to which the annotations refer.

Conferences. A conference on Biology and Civil Engineering will be held at the Institute of Civil Engineers during September 21–23. Among the topics for discussion are causes, effect and prevention of soil erosion; effects of vegetation on drainage and floods; effect of vegetation in stabilizing artificial slopes; use of vegetation to stabilize sand dunes; effect of vegetation on the settling of roads and structures; algal growth and engineering design (**11**; 17.7.48).

In May, 1948, a conference of agricultural and forestry workers was held in Prague, with the following countries participating: Albania, Bulgaria, Czechoslovakia, Hungary, Poland, Rumania, U.S.S.R., and Yugoslavia. The conference was organized by the Institute for International Collaboration in Agriculture and Silviculture with headquarters at Prague. A large number of resolutions were passed (**24**; July/August, 1948).

A conference on the utilization and chemistry of bark will be held September 17 at Boston, under the auspices of the North-Eastern Wood Utilization Council. Developments in utilization of bark from pulp and paper mills as well as from sawmills and lumbering operations, will be reviewed (**24**; July/August, 1948).

Argentina. The Argentine secretariat of Industry and Commerce has ordered the installation of 6 experimental factories for the destructive distillation of wood. These plants will be set up at strategic points throughout the country and will investigate the economic possibilities of different forest species. A large plant for the production of ethyl alcohol is also planned (9; June, 1948).

Austria. United States and British forces in Austria are assisting the Austrian Government in eradicating nun moth. The infested areas of forest have been sprayed from the air with 15,000 gallons of 5% DDT solution and it is estimated that 90% of the moths were killed (**6**; 10.7.48).

Belgium. An order of the Regent (4th February, 1948) directs all occupiers of land to destroy wood-mice [*Mus sylvaticus*] and field voles [*Arvicola arvalis*] as soon as their presence on the land has been made known. Besides the police, agents of the special phytopathological, agricultural and forest services have the right of investigating and reporting infractions of the order (2; May 1948).

A new pressure-impregnation plant, the first to be built in Belgium especially for the pressure treatment of timber with Wolman 'Tanalith' preservative, was opened early in October by the Belgian Minister of Public Works (**17**; 7.10.48).

Canada. The pulp and paper industry of British Columbia is financing the establishment of an arboretum of native trees and shrubs on the north and north-east slopes of Little Mountain, Vancouver (**1**; Aug. 1948).

Forest fires in 1948, up to the end of June, are estimated to have destroyed 750 sq. miles in Ontario, of which 40% was covered by merchantable timber, and 150 sq. miles in Quebec, only 10% of which had any commercial value. The Dominion Department of Mines and Resources

has announced that 14 field parties will be sent out into the forests this summer, to study how fires start and how forests regenerate after burning. A Quebec group has decided that fire insurance of standing timber is feasible, and a company, known as the Limitholders Mutual Insurance Co., has been formed to carry such insurance (**20**; July 1948).

The Ontario Department of Lands and Forests is making plans to salvage timber from the burnt areas round Chapleau and the Mississagi before damage by insects and fungi sets in. Aerial surveys have been used to locate and classify burnt areas, and to determine what can be salvaged immediately. On the basis of this information and that gathered by ground crews, salvage plans will be formulated (**20**; Aug. 1948).

China. With the aid of forestry experts of F.A.O., the National Forestry Research Bureau has just completed an ambitious reforestation project on the bare, eroded hillsides round Nanking. More than 5,000,000 seedlings were planted in the course of a month on an area of 3–4,000 acres. The work of lifting, packing, and planting of the seedlings was done for the most part by refugee labourers paid by relief organizations. Black Locust, Chinese Pine [*Pinus tabulaeformis*], Tallow trees [*Stillingia sebifera*], Bead trees, Willows, Winged nut [*Pterocarya* sp.], Horsetail [*Casuarina equisetifolia*] and other species were planted. After lifting from the nursery, the seedlings were sorted, bundled, and wrapped in straw, and on arrival at the planting sites were put under shade. The appointment of forest protection police to enforce orders regulating grazing, fuel gathering, etc., is considered essential for the establishment of these plantations. There are a further 30,000 acres or more of denuded land round Nanking, which it is hoped to reforest (**4**; 5.4.48).

Eighty per cent. of the 1,400,000 trees planted by the Ministry of Agriculture and Forestry in Anwhei are said to be flourishing. Tree planting is part of the Ministry's programme to rehabilitate land flooded by the Yellow River. An area of 4,800 acres has been reforested. Nurseries have been established at Fengtai and Showhsien to propagate at least 5,000,000 trees for the next Arbor Day (12th March) planting (**4**; 30.9.48).

East Africa. Under the reorganization of research, forestry will be dealt with by E.A.A.F.R.O. (East Africa Agriculture and Forestry Research Organization), which will absorb the existing staff and facilities at Amani. Its main divisions will be concerned with soils, fertilizers, crops and pastures, pests and diseases, animal husbandry, silviculture and forest products. A new headquarters is to be established at a convenient site in a healthy climate some 15 miles from Nairobi, where 6,000 acres of good land have been made available for the purpose by the Kenya Government. In addition, it is intended to have out-stations distributed through East Africa, ultimately one in each ecological zone, using wherever possible the existing agricultural and forestry experiment stations of the territorial departments. One section, concerned with taxonomic botany, will have special duties associated with the Royal Botanic Gardens at Kew in helping to prepare a much-needed Flora of East Africa, and the main herbarium will be established at the Coryndon Museum in Nairobi, where it will be easy for reference (**11**; 9.10.48).

F.A.O. The FAO subcommittee for unexploited forests met at Geneva on 20th-22nd August, 1947, and discussed the following topics:—

(1) *Forest products*, with reference to the desirability of greatly extended use of overseas timbers, involving the need for mechanized logging, for standardization of nomenclature (with a recommendation that FAO should set up a Committee on Identification and Nomenclature), and for intensified research on the properties of such woods (with a recommendation that FAO act as a clearing house for data available at existing institutions, arrange for research at the latter on woods from countries at present lacking facilities for this work, and take the initiative in organizing a joint research institute for such countries). Much importance was attached to research on the seasoning, protection and preservation of overseas timbers.

(2) *Forest protection*, with emphasis on shifting cultivation, fire, and grazing as the three chief menaces, and on the interrelationship of forestry and agriculture in tropical and subtropical regions. FAO's role in these problems should be mainly that of a centre of study and documentation; it

should also seek to stimulate aerial survey and propaganda for good land use, and might advise on new legislation. For the last-named it would be necessary to have detailed information to work on. Efficacy in forest legislation would depend largely on having competent Forest Services to implement it. As facilities for training officers do not exist in some countries, e.g. some Latin-American countries, a long-term solution might be found in the co-operative organization, by FAO and the countries concerned, of a joint, central forestry research and teaching institution.

(3) *Forest Conservation.* It was urged that countries should make every effort to answer FAO's questionnaire for the 'World Forestry Inventory for 1947' as completely as possible. As regards reforestation, emphasis was laid on ecological aspects and the use of local species.

From the discussions it appeared that FAO is not yet well organized to deal with the manifold regional problems, and it is desirable that regional offices should be set up for Latin America and the Far East (**17**; Feb. 1948).

France. France is to have a 1 : 20,000 vegetation map, designed to serve not only agriculturists and foresters but also engineers, land-use planners, the military, etc. The map of the whole country would occupy 8,000 sheets and cannot be completed in the foreseeable future, but a start has been made and the most interesting areas will be mapped first. The project is directed by Prof. L. Emberger, under the Centre National de la Recherche Scientifique, and Dr. J. Braun-Blanquet is its technical director. The work envisaged includes the definition and classification of all plant associations, with a special ecological herbarium and a documentation centre; the education of collaborators, especially those responsible for mapping; and efforts to secure training, for those likely to use it, in the reading and interpretation of the map, which will be accompanied by detailed explanatory matter and small supplementary maps for climatic data, soils, climax vegetation, etc. Only a portion of the Montpellier region is as yet actually printed, but mapping has already been done for more than 20 sheets (**14**; June, 1948).

French West Africa. The introduction of forest trees from Indo-China into French Guinea has shown very interesting results. Planted on a plateau, new stands have not only halted the formation of lateritic soil pan but are also restoring the soil to normal. These exotic species have, moreover, succeeded in forming balanced plant associations with normal regeneration, unhampered by competition from indigenous flora. Another interesting point is that the dense canopy formed by these Indo-Chinese species (*Pinus khasya*, *P. merkusii*, and *Styrax tonkinense*) after rapid growth, precludes ground fires (**24**; Jan./Feb. 1948).

Germany. The School of Forestry of the Berlin University (Eberswalde) and the Dresden School of Forestry at Tharandt have been reopened.

The staff of the first includes five professors of Forest Botany, Forest Management, Soil Science, Forest Technology and Administration and seven lecturers in Forest Protection, Soil Science, Wood Chemistry, Silviculture, and Sawmilling. Dr. K. Hueck is the Dean of the Faculty; the course is eight terms, of which the first three are spent in Berlin and the rest at Eberswalde. The School at Tharandt has a staff of five professors of Forest Botany, Zoology, Forest Soils and Ecology, Forest Management, Plant Chemistry and Timber Research, and one lecturer in Forest Utilization. Prof. H. Sachse is the head of the school; the course is eight terms (**10**; June 1948).

Great Britain. Larvae found during the past year in shipments of Douglas Fir and Hemlock arriving from North America are probably those of *Ergates spicatus*, a longhorn beetle and one of the largest wood-boring beetles in North America. As far as is known, no one has yet been able to rear an adult beetle from larvae which have arrived here, and there is no record of infestation of conifers in this country (**19**; Oct. 1948).

A new type of hardboard, produced by Moulded Components (Jablo) Ltd., Waddon, Croydon, and called Jablo Hardboard, can be used as a substitute for timber for many purposes in building, shopfitting, and furniture-making. It has good strength properties and is highly resistant to decay and insect attack. Its tensile strength is about 1,200 lb./sq. in., and its density 43 lb./cu. ft. Normal moisture content is about 10% at the minimum. Its resistance to flame is definitely better than that

of solid wood. Jablo Hardboard can be sawn, drilled, or nailed in exactly the same way as timber (**21**; 31.7.48).

The English Joinery Manufacturers' Association has designed a standard door for farm buildings, which can be mass-produced and used in units of one or more. It can be fitted either on the hinge or sliding principle and can be altered to any heights between 7 ft. 7 in. and 7 ft. 1 in. (**19**; Aug. 1948).

Two Mulberry piers, one of which was used at Arromanches, have been bought by the Phoenix Timber Co. and installed at Frog Island, Essex, where they have been adapted to make possible a 'ship to truck' delivery in the unloading of timber cargoes. It is hoped that eventually 200 stds. of timber per working day will be unloaded, as against a normal day's discharge of 140 stds. (**19**; Aug. 1948).

Holland. 'Superflex', a new material of Dutch invention which has been patented in a number of countries, is a flexible board consisting of a sheet of veneer to which narrow laths of woods are glued transversely. It combines great flexibility (a sheet made from 10-mm. laths and a 1-mm. veneer will bend to a radius of 50 mm.) with appreciable stability. Oak, Birch, and Sapele [*Entandrophragma* spp.] are used for the external finish. It is suitable for curved panelling and ceilings, columns, exhibition stands, etc. (**18**; 15.7.48).

Iceland. Although this island has now no forests, geological evidence shows that it once had large forested areas, and experiments are now being made in reforestation. Recently 65,000 two-year-old plants of Fir and Pine were transported by air from Tromsö, via Oslo, to Reykjavik. It is hoped that this stock from the north of Norway will be able to acclimatize itself to the cold soil of Iceland and form the nucleus of future forests (**13**; Aug./Sept. 1948).

India. At a meeting of the Conference of Agricultural Ministers in September, it was recommended:—(1) that a minimum proportion of land under forest should be fixed for various natural regions in an administrative unit, to meet physical, agricultural, industrial and defence requirements; (2) that efforts should be made to secure a balanced distribution of forest as part of an integrated land use; (3) that Provinces and States should be requested to secure scientific management of private forest and to enact legislation when necessary; (4) that a Central Board of Forestry should be created, with representatives from the Centre, the Provinces, and States of the Union to secure the implementation of a co-ordinated forest policy (**7**; 23.9.48).

An acute shortage of tea-chests now exists in India. Free imports are prohibited, and domestic production is insufficient to meet total requirements—at present estimated at 5½ million chests annually. Average annual production of plywood tea-chests has been 1½ million, of which not more than 1 million are considered serviceable. The 1948 output is expected to be 2 million. More than 80% of the 40 million sq. ft. of plywood produced annually by the 43 factories in operation, consists of panels for tea-chests (**6**; 3.7.48).

Japan. The Japanese camphor industry was seriously affected by bombing and by the return of Formosa to China. About 60% of Japanese camphor production before the war was in Formosa. Output in 1946 was 1,388 tons compared with 4,329 tons in 1935. Estimated output for 1947 and 1948 is 2,500 and 3,000 tons respectively. Extensive reforestation has been undertaken, but it is expected to be many years before production will equal the pre-war combined Japanese and Formosan output (**6**; 31.7.48).

South Africa. A new method of exterminating the Mimosa Thornbush, which is one of the agricultural pests of South Africa, is being tested in the Cape Midlands by Dr. F. C. Loes, plant pathologist of the Nelspruit Agricultural Station in the Transvaal. The new lethal weapon is a fungus which apparently grows on the roots of the Thornbush and kills it. Dr. Loes has succeeded in obtaining cultures of the fungus and is now attempting to isolate the lethal element in it and to devise a practical means of inoculating Mimosa on a large scale in order to control its natural spread (**5**; Sept. 1948).

Spanish Morocco. The forested area of Spanish Morocco, excluding Cork Oak, is about 32,250 ha., of which 16,100 ha. is Cedar, 6,721 ha. Oak, 5,489 ha. Fir, and 3,941 ha. Pine. The estimated possible annual yield in cu. m. is as follows:—Cedar 20,125, Oak 7,210, Fir 5.489, and Pine 2,955. The Fir [?*Abies numidica*] offers the most attractive prospect for commercial exploitation; many trees have a diameter of 4–5 ft. Exploitation is mostly carried out by private firms under license, and is often haphazard (**6**; 11.9.48).

Trinidad. Contrary to the usual belief that no Balsa is available in Trinidad, a small forest of Balsa trees, estimated to contain a million cu. ft., has now been discovered on the island (**25**; Aug. 1948).

U.S.A. At a meeting of the Western Pine Association at Portland, Ore., in September, it was stated that timber of all species throughout the west is growing at a rate unprecedented in forest history. Both second-growth and old stands show this increase in rate of increment, which is partly due to a wet cycle beginning in 1940. At the same meeting it was reported that the Spruce budworm has attacked about 400 acres of timber stand in the Willamette valley 100 miles south of Portland. This is the first record of the infestation west of the Cascades (**1**; Sept. 1048).

A superior strain of Black Locust [*Robinia pseudoacacia*] found 3 years ago in Randolph County, West Virginia, promises a good seed yield this year, for the first time since its discovery. The trees are straight, have comparatively few branches, and would be exceptionally suitable for pit-props and fence posts. Unlike the Long Island Shipmast type, they reproduce from seed (**16**; 15.9.48).

White Spruce plantations set out in 1931–2 on reforestation areas in New York are now excellent seed producers. Cones collected from plantations in 1947 totalled 784 bushels from which 1,104 lb. of seed were obtained. This is an average yield of 22·4 oz. per bushel of cones, compared with 8–10 oz. from cones collected from natural Adirondack Spruce. Germination of plantation-grown seed was 77%, compared with 60–70% for native Adirondack seed. The plantations were mostly from seed from Maine, New Hampshire and Canada (**12**; May, 1948).

The people of Red Wing and of the Hay Creek valley in Goodhue County, Minn., have taken the first step to halt the terrific erosion and floods which have been damaging farmland, city property, roads, and railroads. On one day last spring, 30 crews totalling 327 persons planted 62,000 trees on 26 farms in the Hay Creek catchment. Everyone turned out—farmers, business men, 145 high-school seniors, and 40 boys from the State training school. Merchants gave employees time off, with pay, to help. Shops closed at noon. The crews worked under foremen trained by the Soil Conservation Service. Farmers and landowners bought the trees at cost price from the Soil Conservation Department, but would have been short of labour but for the volunteer help. The species planted were Norway Pine, Jack Pine, White Pine and White Spruce (**15**; Aug. 1948).

A recent conference of the Federal Communications Commission and industrial users and applicants at Chicago decided that the forest industries are legitimate claimants for radio communications on a national basis. Under the new proposal the forest industries would be assigned permanent wave-lengths, and 62 frequencies have been tentatively allocated to the National Forest Industries Communications, to be shared with the petroleum industry (**22**; Aug. 1948).

The growth of tree roots, which frequently causes stoppage of sewers, can be overcome by the use of copper sulphate or blue vitriol. The crystals dissolve rapidly but lodge in the root masses sufficiently long to be effective. The copper solution both kills the roots and prevents further growth in the sewer; the sewage organisms, both fungal and bacterial, disintegrate the dead masses so that they slough off and are washed away. In spite of the fact that roots are killed in drains by the chemical, no reports of injury to trees have been noted (**23**; March/April 1948).

A Company in Syracuse, N.Y., has developed a new tree-planting sled, the TreeP. It is mounted on runners with steel keels which prevent slipping, and it is claimed that it can be used on any kind of ground. The Lowther Co. of Joliet, Ill., has recently developed two machines and a technique for planting on steep slopes. The first machine makes a two-furrow contour cut and is followed by the second, a tree-planter especially designed for slopes (**3**; Sept. 1948).

The Utah Fish and Game Commission reports the discovery of a tree that may be the oldest on record. It is a scrub Oak [?*Quercus dumosa*], growing in a canyon in a mountainous part of southern Utah, and is 48 ft. high and 18 ft. in diameter (**23**; July/August 1948).

A new adhesive developed in the laboratory of the Timber Engineering Co. has a setting time which will rival in quickness that of the high-frequency gluing method. The new adhesive sets at 75° F., and the setting time is so responsive to changes in temperature that curing time can be freely adjusted to production requirements. Parts glued at room temperature are ready for machining within 10 minutes. Shear strength developed after this period was about 500 lb./sq. in. Ultimate strength, reached in about 24 hours, gives a shear strength approaching 4,000 lb./sq. in. when dense hardwoods are used. The adhesive is water-resistant and non-staining (**25**; Oct. 1948).

'Protekwood', a new board, repellent to rats, is announced by the U.S. Plywood Corporation. It consists of hardwood veneer with impregnated fibre faces, is non-poisonous, and in no way affects poultry or stock (**22**; Oct. 1948).

Dr. Berl of the Carnegie Institute of Technology at Pittsburg is said to have invented a method of producing petrol and coal from vegetable materials such as wood, sugar cane, molasses, sorghum, potatoes, straw, and grass. The process, it is claimed, will transform any materials containing cellulose, starch and sugars, into bituminous coal and raw oils identical with those found in nature (**8**; May/June 1948).

U.S.S.R. A new building material is reported, which is manufactured by a simple process with inexpensive machinery. Fibrous material (reeds, straw, textiles, paper and other wastes) is boiled in an alkaline solution, then soaked in water and ground up. During the grinding process, the fibre is treated with a resinous substance, and the resulting pulp, which at this stage contains 60–70% moisture, is poured under pressure into wire net moulds and put into driers. The material is said to be both heat- and water-resistant, and its insulating properties are such that it is to be used extensively for houses in the Arctic. A roof of this material should not weigh more than $\frac{1}{10}$ of the weight of a tile roof and $\frac{1}{2}$ that of a corrugated iron roof. It requires no beams or rafters, is easily erected and is neither brittle nor fragile (**24**; Jan./Feb. 1948).

A forest of 100-year-old Cedars [*Pinus* sp.?] disappeared in the explosion of the Sikhote-Alin meteorite which fell in the Siberian coastal mountains north-east of Vladivostok early in 1947. The meteorite apparently broke up before reaching the earth. It formed 106 craters and holes, in an area 12 km. long and 600 m. wide. Near the main crater the dense forest is said to have disappeared completely, but round the smaller craters, individual trees remained standing, though shot through with meteoritic fragments (**24**; Jan./Feb. 1948).